ABSTRACT

We report the discovery of a large population of dwarf irregular galaxies in the two nearest groups of galaxies outside the Local Group, the Sculptor and the Centaurus A groups (2.5 and 3.5 Mpc). Total areas of approximately 940 and 910 square degrees in these groups were scanned visually on the SRC J films to find dwarf candidates. Redshifts were obtained by an HI survey carried out at Parkes, with detection limits of $4 \times 10^6$ $M_\odot$ and $7.8 \times 10^6$ $M_\odot$, and 33 dwarf galaxies were successfully detected in the groups. A follow-up optical survey ($H\alpha$ spectroscopy) detected a few more, and confirmed most of the HI redshifts. A total of 16 and 20 dwarf galaxies are found in Sculptor and Centaurus A, of which 6 are newly identified objects, and 5 more have newly determined redshifts.

In both groups the dwarf members show a wider spatial and velocity distribution than the brighter members. From their radial velocities and projected distances we estimate the crossing times of the groups, which confirm that they are not yet virialised.
1. Introduction

Dwarf galaxies are by far the most numerous type of galaxies, not only in the Local Group but also in the nearby clusters which have been studied in detail (eg. Sandage & Binggeli 1984 for Virgo; Caldwell & Bothun 1987 for Fornax). It should therefore be normal to assume that nearby groups of galaxies contain similarly a large population of dwarfs. However it is often believed that these nearby groups are devoided of gas-rich dwarfs at least, based on earlier HI surveys of Lo & Sargent (1979) and Haynes & Roberts (1979). Yet these surveys were done with only very sparse samplings in the case of the Sculptor group, and to sensitivities of a few times $10^7 \, M_\odot$ for the M81, CVnI, and NGC 1023 groups. Finding nearby dwarf galaxies is crucial in defining the faint-end of the luminosity function of galaxies, which has far-reaching consequences in the study of faint galaxy populations and galaxy formation in general. But redshift surveys of apparent-magnitude-limited samples are, for various reasons, not very efficient at finding low-luminosity systems.

The Sculptor group and the Centaurus A group of galaxies are the most nearby groups in the southern Hemisphere. Being roughly 3 magnitudes closer than the Virgo and Fornax clusters they bring us a unique opportunity to study the very faint end of the luminosity function. The goal of this project was therefore to investigate the dwarf population in these two groups, especially the gas-rich dwarf irregulars (dIrrs). It is much easier to get redshifts for dIrrs (in HI) than to determine redshifts for dEs candidates, and also our main interest was to carry out dark matter studies on dIrrs.

The Sculptor and Centaurus A groups offer very different environments to their dwarf population. The Sculptor group is mainly composed of late-type spiral galaxies. Its five major members, NGC 55, NGC 247, NGC 253, NGC 300, and NGC 7793, are almost all normal gas-rich systems, and their properties are listed in Table 1. Our adopted distance, based on numerous distance indicators (listed in Puche & Carignan 1988) will be 2.5 Mpc. Two more galaxies, NGC 45 and NGC 24, also late-type spirals, are found in the same region but several Mpcs further away, possibly forming an extension of the group. Amongst the Sculptor members only NGC 253 shows starburst activities while the other galaxies are quiescent. Their HI distributions have been mapped in details at the VLA by Carignan & Puche (1990a, 1990b), Puche et al. (1990, 1991a, 1991b). Miller (1996) has imaged in Hα the known dwarf members of the group and detected only two with current star formation. The Centaurus A group on the other hand is a loose chain of galaxies, a heterogeneous assembly of early to late-type galaxies, having the largest dispersion of morphological types amongst all of the 55 nearest groups (de Vaucouleurs 1979). Almost all of the major members are abnormal. Not only is NGC 5128, Centaurus A itself, one of the most peculiar radio galaxies, but the other main members also show signs of activities. For example
NGC 5236 (M83) has a starburst nucleus and possesses an anomalously high supernovae rate (Telesco & Harper 1980), and an asymmetric HI velocity field (Lewis 1969). NGC 5253 also shows starburst activities and a high supernovae rate (e.g. van den Bergh 1980), and a very disturbed Hα velocity field (Taylor 1992). NGC 5102 is an unusual S0 galaxy in a post-starburst phase (Pritchet 1979). And NGC 4945 has a Seyfert nucleus emitting variable hard X-rays (Moorwood & Olivia 1994). Several authors have suggested that these peculiarities are induced by accretion of gas-rich dwarf systems (Graham 1979; van Gorkom et al. 1990). Therefore the study of the gas-rich dwarfs in this group is of particular interest. The main members are listed in Table 2, and the adopted distance for this group is 3.5 Mpc based on the newly derived distances for these galaxies (see the Table). It is therefore the second nearest group outside the Local Group, more or less ex-aequo with the M 81 group (from Cepheids M 81 is placed at 3.6 Mpc, Freedman et al. 1994).

This paper, the first of a series, presents the redshift surveys for finding dIrrs in Sculptor and Centaurus A. Further papers will present full B,R,I photometry of these nearby dwarfs (Côté et al. 1997a), the neutral hydrogen kinematics of a sample of these objects (Côté et al. 1997b) and finally the dark matter studies for that sample of dIrrs (Côté et al. 1997c).

2. The Survey

2.1. Visual survey

The first step was to find dwarf galaxy candidates in the region of the Sculptor and Centaurus A groups from visual inspection of SRC J survey films. These groups, because of their proximity, subtend very large angles on the sky. The areas on which to select candidates were determined from the sky coverage of the already-known galaxy members in each group (main members as well as dwarf members known at the time). The fields thus retained for visual scanning were those with centers between:

\begin{align}
23^h \leq \alpha \leq 2^h ; & \quad -20^\circ \geq \delta \geq -45^\circ \\
12^h30^m \leq \alpha \leq 15^h ; & \quad -20^\circ \geq \delta \geq -50^\circ
\end{align}

for the Sculptor and Centaurus A groups respectively, where \(\alpha\) and \(\delta\) are the right ascension and declination at epoch 1950. This corresponds to wide areas of approximately 50 SRC survey films in each case.

Each film was inspected visually with a small magnifier, scanning once North to South, then West to East, to locate all objects which could be irregular galaxies at low redshift. A
dwarf irregular should be easily identifiable at such a small distance of a few Mpc, showing much structural details, with even the brightest stars resolved. We selected particularly all low-surface-brightness galaxies which showed some degree of stellar resolution, or some distinct H II regions or condensations, including all objects with small bulges or some form of high-surface-brightness central regions, and those composed of bright knots embedded in low-surface-brightness envelopes. The objects excluded from the candidate list were giant ellipticals and obvious distant giant spirals (judged as such from the relative sizes of the bulges and the tightness of the spiral arms). With these criteria we should have included in our candidate lists all gas-rich dwarfs like dwarf spirals, dwarf irregulars, and blue compact dwarfs (BCD) as well, although some BCDs that appear as a single symmetric burnt-out clump on the SRC films with no associated low-surface-brightness envelope would have escaped us, being indistinguishable from background ellipticals.

A total of 123 dwarf galaxy candidates for the Sculptor Group and 145 for the Centaurus A Group were thus identified, with no redshifts in existing galaxy catalogues at the time, including the RC2 (de Vaucouleurs et al. 1976), the Nearby Galaxies Catalog (Tully 1988), the ESO Catalog (Lauberts 1982), the Southern Galaxy Catalog (Corwin et al. 1985), the HI Catalog of Galaxies (Huchtmeier and Richter 1989), and the NASA/IPAC Extragalactic Database\(^1\) (NED). These candidates are spread on the sky over approximately 940 and 910 square degrees. Amongst these, 58 objects are identified for the first time and are named with the sigla 'SC’ or ’CEN’ (see Tables 3 and 4).

2.2. HI survey

Dwarf irregular galaxies being normally gas-rich, the easiest way to determine their redshift is with 21cm HI line observations. Some of these galaxies like DDO 154 for example (Carignan & Freeman 1988) have actually 5 times more mass in HI than in stars. And at such low redshift it is not very time-consuming to get down to an interestingly low detection limit (in terms of HI solar mass) using a single-dish telescope. Also since the groups are so widespread on the sky there is little chance of confusion even with a large beam. The HI observations were carried out in August 1990 for the Sculptor candidates and February 1991 for the Centaurus A ones, at the 64m Parkes Radiotelescope. The telescope had a half-power beamwidth of 14.8′ at 21cm and a sensitivity of 0.63 K/Jy. The front end was a cryogenic FET receiver yielding a system temperature of \(T_{\text{sys}} \sim 40\) K. The back end was

\(^1\)The NASA/IPAC Extragalactic Database (NED) is operated by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.
the 1024 channel digital autocorrelator (Ables et al. 1975), configured to give two 512 channels spectra (1 spectrum for each of two orthogonal polarizations), with a bandwidth of 10 MHz. This resulted in a channel separation of 4.1 km s\(^{-1}\) and a velocity resolution after Hanning smoothing of 8.2 km s\(^{-1}\), covering a velocity range of roughly \(-200\) to \(1800\) km s\(^{-1}\). This setup ensured that we were surveying a wide enough velocity interval for these two groups whose main members have heliocentric velocities between 116 and 669 km s\(^{-1}\), as well as preserving a good enough resolution to distinguish dwarf galaxies profiles. These do not necessarily have large rotation velocities and therefore their profiles can often look like asymmetric gaussians, of much smaller widths than for spirals (see Karachentseva 1990 who classified 539 dwarf HI profiles). The flux density calibration was carried out by observing Hydra A (PKS 0915-18), with an adopted flux density of 43.5 Jy at 21cm, and the velocity scale was checked on the source UKS 1908-621 which has a radial heliocentric velocity \(V_{\text{sys}} = 946\) km s\(^{-1}\) and a profile width of \(\Delta V_{20} = 92\) km s\(^{-1}\). Each observation consisted of a 10 minutes integration on source, alternated with a 10 minutes integration on a sky reference position lying 10 minutes away to the east, so that the same position (in hour angle) was observed during this reference scan to get the same background.

The reductions were performed with SLAP, an interactive spectral line reduction package developed at Jodrell Bank, and POSP, developed at NRAO. The sky reference spectra were used to subtract the sky and remove large baseline variations, and the two polarization spectra were then co-added. This baseline was interactively determined by masking out any emission and fitting a low order chebyshev polynomial. The zeroth and first moments of the emission were calculated to obtain the total flux and heliocentric velocity of the galaxy. Line widths were determined at the 20% and 50% peak flux levels. The resulting spectra had rms values typically around 30 mJy, and so our 3\(\sigma\) detection limits in Sculptor and Centaurus A are \(4 \times 10^6\) M\(_{\odot}\) and \(7.8 \times 10^6\) M\(_{\odot}\) (for our adopted distances of 2.5 Mpc and 3.5 Mpc respectively). Tables 3 and 4 list for all the HI detections the heliocentric velocity of the galaxy, the HI integrated flux, and the linewidth at the 20% level. The velocity quoted is an average of the intensity-weighted velocity, and the midpoint velocities at the 50% and 20% levels. Errors on these velocities are typically 2 km s\(^{-1}\).

However one needs to be cautious when detecting HI emission in the velocity range 100 km s\(^{-1}\) to 600 km s\(^{-1}\) in the direction of the Sculptor and Centaurus groups: many High Velocity Clouds (HVC) associated with our Galaxy are known to have velocities sometimes as high as 400 km s\(^{-1}\) (Wakker 1990). So it could happen that such a HVC is lying in the 15' Parkes beam towards a candidate object (which could actually be a background object), confusing us into believing that the HI detected belongs to that galaxy. In fact there are
some HVCs with high positive velocities known to lie in the \((l,b)\) area of both groups (Wayte 1990; Wakker 1990). These are not the only possible source of confusion: intra-group HI clouds have been detected in the Sculptor group by Haynes and Roberts (1979) who made extensive mapping in that region with the Green Bank 140ft and found several seemingly ‘free-floating’ HI clouds. From their observations it is not clear actually if these clouds are genuine intergalactic HI clouds, mere HVCs, or some component of the Magellanic Stream (Mathewson et al. 1974), but for our purposes all these possibilities are to be considered HI pollution. Therefore in order to discriminate genuine nearby dwarf HI emission from HI HVCs or clouds, further 5-point mappings were carried out in May 1991 and September 1991. This consists of integrating 15’ away (one beam width) from the source to the North, South, East and West (or in a cross pattern: North-West, North-East, etc). In the case of a dwarf galaxy the HI emission will be mostly concentrated in the middle beam, and velocity variations between different pointings will indicate rotation; for a HI cloud the extended emission is less ordered in velocity and on the sky. It is also very useful for the dwarfs that lie near a HI-rich large galaxy like M83 or NGC 4945, where one can detect HI flux in the sidelobes of the beam and so one component in the spectrum will be due to the HI envelope of the large galaxy; in this case a 5-point mapping helps confirming that there is an independent object as well in the spectrum. However this 5-points method works only if there is actually some emission 15’ away and so is not always a useful discriminant between dwarfs and usurper HI clouds. The clearest way to discriminate between HI pollution and genuine dwarfs is to try to get a redshift optically in \(H\alpha\) for these objects. The presence of \(H\alpha\) at the same velocity as HI indicates the presence of star formation, therefore ruling out a neutral cloud.

2.3. \(H\alpha\) survey

The \(H\alpha\) spectroscopy observations were carried out in April 1991, August 1991 and November 1991, with the Double Beam Spectrograph (DBS) on the MSSSO 2.3m telescope. Not only did we observe the objects detected in HI at the groups’ velocities (ie: the objects that needed confirming because of HVCs etc), but also all the objects on our catalog lists which were not detected at all in HI, in the hope to identify new dwarf galaxies weak in HI but detectable in \(H\alpha\). The long slit was about 6’ and was set to a width of 3”, positioned when possible along the major axis of the object. The detector used was a photon–counting–array with a spatial resolution of 0.67” per pixel. The 1200 G/mm gratings were used in the blue and red arms, covering spectral ranges of 4950 to 5250 Å in the blue, and 6450 to 6750 Å in the red, at 0.4 Å per pixel (18 km s\(^{-1}\) at \(H\alpha\)). This blue arm setup was to target the \([\text{O III}]\) 4959 and 5007 Å lines, but these lines being always
fainter than the Hα, in most cases the velocities were determined from the Hα alone. Exposures were 2000s per object, or were stopped before that when sufficient signal-to-noise was achieved for a redshift determination.

Spectral reduction was carried out with the FIGARO package from K. Shortridge (AAO). Each galaxy observation was bracketed with arc lamp exposures for wavelength calibration. Sky spectra were extracted from the frames at regions well outside galactic emission. Gaussian profiles were then fit to the emission lines, and a heliocentric correction was applied to the resulting velocities. These are listed in Tables 3 to 6, and have errors of typically 10 km s$^{-1}$.

3. Results

3.1. Membership of Sculptor and Centaurus A

Of the 123 and 145 original candidates in Sculptor and Centaurus A, all observed, we obtained new redshifts for 108 objects. For 61 other objects, redshifts were found in the literature during the course of the project, for example when the RC3 became available, and for simplicity are not repeated in our Tables 3 and 4; they can be found in the RC3, Maia et al. (1993), Dressler (1991), Da Costa et al. (1991), Fouqué (1990), Rhee (1992), and Parker (1990). Finally 74 objects remain redshiftless.

A total of 16 dwarfs are found to be members of the Sculptor group and 20 of the Centaurus A group, and are listed in Tables 5 and 6. Amongst these, 25 were already known in the literature (we confirmed their redshift), 5 more were already identified and catalogued but without known redshifts, and finally 6 of these objects are identified for the first time. None of these 6 new objects had been detected by IRAS. These 36 members of Sculptor and Centaurus A include all our objects with confirmed redshifts in Hα, as well as those detected only in HI but with successful 5-points mappings. Only 21 of these dwarfs had their HI emission confirmed with an Hα redshift. And 3 more objects, not detected in HI, were found in the Hα survey: AM 0106-382 in Sculptor, as well as NGC 5206 and ESO 272-G025 in Centaurus A. Further deeper integrations in HI at Parkes still did not detect any neutral gas content, bringing their HI upper limit to $M_{HI} < 2.8 \times 10^6 M_\odot$ for Sculptor and $M_{HI} < 5.5 \times 10^6 M_\odot$ for Centaurus A. Several HVC’s were indeed found in the line-of-sight of some of our candidates as suspected: in all, 15 HI detections were rejected from our dwarf lists, either after the 5-point mapping, or after obtaining an Hα detection at higher redshift. These HVC HI profiles are considerably more messy that the confirmed galaxies’ profiles. We are therefore confident that the 12 dwarfs which remain
unconfirmed in Hα but were kept in the sample judging from their 5-point mapping are bona fide dwarfs. Moreover, subsequent surface photometry, to be presented in Côté et al. (1997a), shows that these objects have the same blue mean colours as our confirmed dwarfs sample.

Amongst other known objects in the literature to be found in the Sculptor region is UGCA 438 (alias UKS 2323-326), which we decided not to include as a Sculptor member: Longmore et al. (1978) who discovered it estimated a distance of 1.3 Mpc using the brightest stars, although van den Bergh (1994) claims it does not belong to the Local Group, based on its location on the (heliocentric velocity) versus (distance from the solar apex) diagram. So it might be lying in fact between the two groups. Two other controversial cases are ESO 294-G010 and ESO 410-G005 which were included in Miller’s (1994) work on Sculptor dwarfs, but which we have not considered members here, because ESO 294-G010 shows a 2.5σ detection at 4450 km s\(^{-1}\) and ESO 410-G005 was not detected neither in HI nor in Hα (we have preferred to include only the objects proven to be in the groups rather than those that have not been proven to be in the background).

It should be stressed again that only positions of candidates selected visually on the films were observed, i.e.: no Parkes HI integrations at random positions on the sky were performed in the regions of the two groups. It is therefore more than probable that many more faint dwarfs are to be found in these regions. A survey with the Parkes 21cm Multibeam receiver for example could provide a more complete sample down to an interesting HI mass limit with full coverage over the area of the groups.

The spatial and velocity distribution of the 36 confirmed dwarfs of Sculptor and Centaurus A are shown in Figures 4 and 5, and will be discussed at greater length in section 3.3.

3.2. Morphology of the dwarfs

All the confirmed dwarfs are shown in Figure 3 in a montage of enlarged SRC J prints. Their optical sizes range from about 40'' up to 11' (0.5 kpc to 11 kpc). This atlas reveals a large diversity of morphologies, although a few subclasses of dwarfs are noticeable. ESO 383-G087 is certainly a dwarf spiral (type Sm), being in fact one of the rare dwarf galaxies with clear spiral structure. Other dwarf spirals are ESO 274-G001, which even has a small nucleus, while DDO 6, DDO 161, and DDO 226 show hints of a bar, but no nuclei. A few objects can be classified as BCDs (like ESO 347-G017, NGC 5264 or NGC 5408), harbouring compact regions of very high surface brightness, although only ESO 347-G017
satisfies the strict Thuan and Martin (1981) criterion that the localized star-forming region should be < 1 kpc. ESO 272-G025 and AM0106-382 are possibly extreme BCDs: they have the most compact star-forming regions, and are amongst the only three objects which were not detected in HI, perhaps because the gas has been successfully expelled as is often believed to happen in low-mass BCDs during their burst of star formation. Most of our objects are gas-rich dwarf irregulars, with sparse H II regions either concentrated in the center of the low-surface-brightness envelope (ESO 324-G024), or dispersed through the whole envelope (ESO 381-G020). Amongst these LSB objects, some like DDO6 or ESO 293-G035 have an almost ‘cometary’ look, with a clump of H II regions at one extreme of a otherwise LSB disk. These particular ‘cometary dwarfs’ are actually very similar to many faint galaxies now revealed in the HST Deep Field. BCDs with similar morphologies were also found by Loose & Thuan (1985), who suggested that it is due to self-propagating star formation which stopped at the edge of the galaxy.

These cometary dwarfs contrast with dIrr objects like ESO 444-G084 or SGC142448-4604.8 that are of extremely low surface-brightness overall. Some objects like SC2 or CEN6 are just too ‘dwarfish’ to discern any features but appear significantly distorted. Finally, although this survey was focusing on gas-rich dwarfs, some early-types were caught in the sample: NGC 5206, not detected in HI, is a rather symmetrical-looking dE, whose light profile is well-fitted by a de Vaucouleurs $r^{1/4}$ law (Prugniel et al. 1993). Following Binggeli and Cameron’s (1991) classification for early-type dwarfs, NGC 59 qualifies to be a dS0 type B (for its high flattening) and NGC 5237 a dS0 type D (for its boxiness). Surface photometry results will be presented in Côté et al. (1997a), which will also present the luminosity function obtained, and discuss the selection and completeness of the survey.

### 3.3. Spatial and velocity distribution

The distribution on the sky of the member dwarfs is shown for each group in Figure 4. In both groups the dwarfs are more widely spread than the brighter main galaxies. Despite the difference of environment in the two groups the spatial coverage of the dwarfs is found to be rather similar for both. In each case an appendage of dwarfs is spearing away from the main members, while a few other objects have gathered near massive members, like NGC 247 or M83, and even though these dwarfs are not all bound to these bright galaxies they probably respond more to these galaxies’ potential then to the overall-group potential. Interestingly just as the main Centaurus A members are aligned in a long chain, the dwarf members show also such a elongated structure albeit heading more in a south-east direction. In the Sculptor group as well the dwarfs extend out to the south-east. This is not due to
some selection bias related to obscuration effects, because for Sculptor the galaxy NGC 253 is very near the South Galactic Pole (at $b = -88^\circ$), while for Centaurus A the galactic plane lies to the south (NGC 4945 is at $b = 13^\circ$). In fact the distribution of candidate objects from our original lists is very uniform in the regions surveyed (for Sculptor it is even slightly skewed towards the North).

Figure 5 shows the velocity distribution of the dwarfs in each group, where their declination is plotted against their velocity $V_{LG}$ ($V_{LG}$ is the velocity relative to the Local Group, which is more useful than the heliocentric velocity because of the groups being so spread out on the sky: we used the Yahil et al. 1977 formula for the correction). Here again one can see how the dwarfs have a wider velocity coverage than their bright companions. However it is quite clear from this figure where each group cuts off in velocity-space, i.e.: the dwarfs do not cover the whole observed velocity range uniformly. Both groups are well ‘contained’ in velocity space, not overlapping with any string of stray dwarfs. Only at $V_{LG} > 1000$ km s$^{-1}$ appears another agglomeration of galaxies, which Tully’s catalogue (1988) refers to as the ‘Centaurus Spur’. This is similar to what is observed in more extensive surveys, in which dwarfs are loosely following the bright galaxies distribution, and are found on the edges of the voids but do not seem to be filling these voids (see for example Thuan et al. 1991).

The fact that the dwarfs distribution is wider spatially than that of the more massive members is reminiscent of the situation in the Local Group, where most of the dIrr galaxies sit in regions of low density, out at the fringes of the group. A similar behaviour has been observed as well for the late-type dwarfs of nearby clusters, like Virgo for which Bothun et al. (1985) conclude that the normal late-type spirals as well as the dIrrs form an extended cluster population that has not yet fallen into the Virgo core (see also Binggeli et al. 1987). Also observed in the Virgo cluster is a general HI deficiency in the spirals, which also have smaller characteristic HI sizes than field spirals (Cayatte et al. 1994). Here for Sculptor and Centaurus A there are no significant changes in the HI properties of dwarfs at the periphery of the group compared to those near the center of mass of the group or orbiting a bright member, and in such small and loose groups one does not expect to encounter the gas–removal processes that operate in denser groups or clusters.

3.4. Group kinematics

The sample of radial velocities of the dwarfs and their projected distances from the center of mass of each group can be used to estimate their velocity dispersions and also their crossing times. The line-of-sight velocity dispersions obtained for Sculptor and Centaurus
A are 202 km s\(^{-1}\) and 150 km s\(^{-1}\) respectively, which are typical for groups of this size. For the crossing times estimates, the centers of mass were adopted to be at the mean projected position and velocity of the most massive galaxies in each group: NGC 5128 and NGC 5236 for Centaurus A, and NGC 253 and NGC 247 for Sculptor. NGC 45 and NGC 24, being at least at twice the distance of the other Sculptor members, were excluded from this estimate. Although NGC 247 is less luminous than NGC 7793, its maximum rotational velocity is larger. In fact from the mass-models of Puche & Carignan (1991) and Carignan & Puche (1990), NGC 253 and NGC 247 together provide about 90% of the mass of the group.

The indicative crossing time (see Rood & Dickel 1978) is then calculated by:

\[ t_{\text{cross}} = \frac{2\langle r \rangle}{\pi \langle |\Delta V| \rangle} \] (3)

where \( \langle r \rangle \) is the average projected radial distance from the center of mass, and \( \langle |\Delta V| \rangle \) is the mean absolute radial velocity from the center of mass. Table 7 shows the results: the crossing times are quite long, \(3.2 \times 10^9\) years and \(4.5 \times 10^9\) years respectively, a considerable fraction of a Hubble time, which shows that these two groups are probably not virialised. The fact that the groups are unvirialised is hardly surprising: for Centaurus A the spatial distribution of the objects in a long chain is easily noticeable, and for Sculptor the velocity distribution is clearly non-Gaussian. Figure 6 illustrates this point, where cumulative velocity histograms are shown for each group. The Sculptor histogram shows a plateau near \( |\Delta V| = 0 \); ie rather few dwarfs have velocities close to the center of mass velocity. In Figure 7 we plot \( |\Delta V| \) against \( \Delta r \) for each object; here again it is verified that there is qualitatively no obvious signature of virialisation; the points cover the whole \(|\Delta V| - \Delta r\) area which indicates that these two loose groups are still collapsing.

The situation in Sculptor and Centaurus A is however far from being unusual. Turner & Gott (1976) have calculated crossing times for groups identified by Sandage, Tamman and de Vaucouleurs, and concluded that most groups are just now entering the virialised regime. Giuricin et al. (1988) finds that 75% of the groups in Geller & Huchra’s (1983) catalogue are still in the phase of collapse and not yet virialised. Even cluster virialisation has now been put in doubt, as X-ray maps start revealing distinct subclustering, also seen optically as more redshifts come available like in the Coma cluster (Colless & Dunn 1996). Our own Local Group is certainly still collapsing (Gunn 1974). In fact, looking in redshift space, the Sculptor group seems to form one long appendage to the Local Group and on to the M81 group on the other side, as if these 3 groups were born out of the condensation of the same cloud, in which these 3 ‘clumps’ have not yet quite collapsed (it is referred to as the ‘Coma-Sculptor Cloud’ in Tully’s Catalog 1988). This makes the determination of masses and mass-to-light ratios for these groups rather difficult. If we naïvely apply the
virial theorem to Sculptor and Centaurus A, we obtain mass-to-light ratios of $M/L_B = 98$ and $M/L_B = 29$ respectively (using $L_B$ from RC3 B values and our adopted distances of 2.5 and 3.5 Mpc). But if we require the groups to be bound only, their masses are then a factor of two smaller than those obtained here from the virial theorem. That would bring the mass-to-light ratio of the whole Centaurus A group into a regime similar to mass-to-light ratios of single galaxies. In the case of Sculptor however we have to conclude that the mass-to-light ratio of the group exceeds that of individual galaxies and suggests the presence of a large amount of dark matter in the group.

There are more sophisticated techniques to study the dynamics of loose groups. Peebles (1989, 1990, 1994) in a series of papers explored a new method of tracing nearby galaxies’ orbits back in time, using a numerical application of the action variational principle (see also Dunn & LaFlamme 1993, 1995). His predicted velocities agree well with the observed velocities for the neighboring groups of galaxies within 3 Mpc when they are assigned M/L of as much as $\sim 150 \, M_\odot/L_\odot$. Our new dwarfs will be very valuable in testing this mass model.

4. Summary

A total of 123 and 145 dwarf galaxy candidates in the two nearest groups of galaxies Sculptor (2.5 Mpc) and Centaurus A (3.5 Mpc) were selected visually on SRC J films, over areas of 940 and 910 square degrees respectively. From an HI Parkes survey, with detection limits of $4 \times 10^6 \, M_\odot$ and $7.8 \times 10^6 \, M_\odot$, 33 dwarf galaxies were detected in the redshift ranges of the groups. A follow-up $H_\alpha$ spectroscopic survey has confirmed 21 of these redshifts, and has found 3 more objects not detected in HI.

A total of 16 dwarfs are therefore found to be members of the Sculptor group, and 20 of the Centaurus A group. Most of these objects were already known in the literature, but 5 members have newly determined redshifts and 6 other members are identified for the first time.

These objects are mostly dIrrs but with a variety of morphologies. Their global properties will be presented in subsequent papers.

The dwarf members have a broader distribution spatially and in velocity than the brighter members of each group. As most nearby groups, Sculptor and Centaurus A are not yet virialised.
5. Acknowledgements

It is a pleasure to thank Bruno Binggeli, Evan Skillman, and Jacqueline van Gorkom for many interesting comments. This survey was started at Université de Montréal with the help of Serge Demers, Pierre Chastenay, and especially Nathalie Martimbeau who produced all the finding charts. SC thanks Tom Broadhurst for his constant criticism. Thanks to J.English, A.Koekemoer, H.Liang, C.Lidman, R.Vaile and especially E.Troup for their help on the Parkes observing run. The Parkes telescope is part of the Australia Telescope National Facility, which is operated in association with the Division of Radiophysics by CSIRO. This project would have been a nightmare without the help of the NASA/IPAC Extragalactic Database (NED), which is operated by the Jet Propulsion Laboratory, Caltech, under contract with the National Aeronautics and Space Administration. Financial support for this work was provided by an Australian National University Postgraduate Scholarship, and by Fonds FCAR Québec.
Table 1. Main members of the Sculptor group.

| Name    | R.A. & Dec. (1950) | Type   | $V_\odot$ (km/s) | $B_T$ | Distance (Mpc) | $M_T$ | Ref. |
|---------|--------------------|--------|------------------|-------|----------------|-------|------|
| NGC 7793 | 23 55 15 -32 52 06 | SA(s)d | 230              | 9.61  | 3.38           | -18.03| 1    |
| NGC 55  | 00 12 24 -39 28 00 | SB(s)m | 125              | 8.39  | 1.6            | -17.72| 1    |
| NGC 247 | 00 44 39 -21 02 00 | SAB(s)d| 159              | 9.60  | 2.53           | -17.41| 1    |
| NGC 253 | 00 45 07 -25 33 42 | SAB(s)c| 251              | 7.99  | 2.58           | -19.07| 1    |
| NGC 300 | 00 52 31 -37 57 24 | SA(s)d | 142              | 8.70  | 2.1            | -17.91| 2    |
| NGC 24  | 00 07 24 -25 14 36 | SA(s)c | 554              | 12.13 | 11.08          | -18.09| 1    |
| NGC 45  | 00 11 32 -23 27 35 | SA(s)dm| 468              | 11.32 | 4.35           | -16.93| 1    |

Note. — The $B_T$ magnitudes are the RC3 values, corrected for Galactic extinction. The distances are from: 1) Puche & Carignan 1988 and references therein; 2) Freedman et al. 1992.
Table 2. Main members of the Centaurus A group.

| Name        | R.A. & Dec. (1950) | Type         | $V_\odot$ (km/s) | $B_T$ | Distance (Mpc) | $M_T$ | Ref. |
|-------------|--------------------|--------------|------------------|--------|----------------|--------|------|
| NGC 4945    | 13 02 31 -49 12 12 | SB(s)cd sp   | 560              | 8.45   | 3.18           | -19.06 | 1    |
| NGC 5068    | 13 16 13 -20 46 36 | SAB(rs)cd    | 672              | 10.37  | 5.11           | -18.17 | 1    |
| NGC 5102    | 13 19 07 -36 22 12 | SA0-         | 467              | 10.13  | 3.12           | -17.34 | 2    |
| NGC 5128    | 13 22 32 -42 45 33 | S0 pec       | 562              | 7.32   | 3.50           | -20.4  | 3    |
| A1332-45    | 13 31 39 -45 17 06 | SB(s)m       | 826              | 11.27  | 5.25           | -17.33 | 1    |
| NGC 5236    | 13 34 12 -29 36 48 | SAB(s)c      | 516              | 8.05   | 3.70           | -19.79 | 1    |
| NGC 5253    | 13 37 05 -31 23 30 | Im pec       | 404              | 10.67  | 4.09           | -17.39 | 4    |

References. — 1) de Vaucouleurs 1979; 2) McMillan et al. 1994; 3) Hui et al. 1993; 4) Sandage et al. 1994.
Table 3. Catalogue of dwarf candidates for the Sculptor group.

| Name      | R.A. & Dec. (1950) | \( V_\odot \) km s\(^{-1} \) | Int. Flux Jy km s\(^{-1} \) | \( \Delta V_{20} \) km s\(^{-1} \) | \( V_\odot \) km s\(^{-1} \) |
|-----------|------------------|----------------|----------------|----------------|----------------|
| ESO 406-G040 | 22 57 33 -37 28.1 | 1248           | 4.2            | 67             |                |
| ESO 406-G042 | 22 59 25 -37 21.2 | 1377           | 7.1            | 143            |                |
| MCG-05-54-024 | 23 11 07 -29 51.5 |                |                |                |                |
| ESO 407-G011 | 23 12 13 -34 02.7 |                |                |                |                |
| SC1        | 23 16 54 -31 37   |                |                |                |                |
| SC2        | 23 17 56 -32 10.8 | 68             | 10.4           | 49             |                |
| ESO 347-G008 | 23 18 09 -42 00   | 1622           | 8.6            | 76             | 1606           |
| ESO 347-G017 | 23 24 16 -37 37.3 | 702            | 10.5           | 104            | 659            |
| SC3        | 23 25 51 -27 05.8 |                |                |                |                |
| SC4        | 23 26 40 -33 35.3 |                |                |                |                |
| ESO 470-G016 | 23 28 18 -27 56.8 |                |                |                |                |
| MCG-05-55-020 | 23 28 21 -27 48   |                |                |                |                |
| SC5        | 23 28 59 -27 28.5 |                |                |                |                |
| SC6        | 23 30 13 -28 47.2 |                |                |                |                |
| ESO 291-G031 | 23 31 39 -46 16   | 1494           | 6.5            | 96             |                |
| MCG-05-55-026 | 23 32 59 -26 57.5 |                |                |                |                |
| SC7        | 23 33 48 -23 18   |                |                |                |                |
| ESO 292-G002 | 23 34 51 -43 53.8 |                |                |                |                |
| ESO 537-G001 | 23 40 23 -26 36   |                |                |                | 3780           |
| UGCA 442   | 23 41 10 -32 13.8 | 274            | 54.3           | 114            | 283            |
| SC8        | 23 43 57 -32 50.5 |                |                |                |                |
| ESO 348-G009 | 23 46 47 -38 03   | 656            | 8.4            | 98             | 628            |
| SC9        | 23 48 19 -23 16.1 |                |                |                |                |
| SC10       | 23 48 25 -29 48.5 |                |                |                |                |
| SC11       | 23 51 01 -26 37.5 |                |                |                | 3006           |
| SC12       | 23 51 42 -22 57.5 |                |                |                |                |
| SC13       | 23 53 45 -42 01.7 |                |                |                |                |
| SC14       | 23 54 23 -31 11.2 |                |                |                |                |
| SC15       | 23 56 03 -24 49   |                |                |                |                |
| SC16       | 23 56 07 -31 44.6 |                |                |                |                |
| SC17       | 23 58 15 -26 45.4 |                |                |                |                |
| SC18       | 23 58 22 -41 25.6 | 151            | 4.6            | 46             |                |
| ESO 409-G008 | 00 00 18 -32 08.4 |                |                |                | 7427           |
| SC19       | 00 00 57 -26 51.3 |                |                |                |                |
Table 3—Continued

| Name            | R.A. & Dec. (1950) | HI detected: $V_\odot$ km s$^{-1}$ | HI detected: Int.Flux Jy km s$^{-1}$ | HI detected: $\Delta V_20$ km s$^{-1}$ | HI detected: $V_\odot$ km s$^{-1}$ |
|-----------------|--------------------|----------------------------------|-------------------------------------|---------------------------------------|----------------------------------|
| ESO 538-G021    | 00 03 13 -22 21.3  |                                  |                                     |                                       |                                  |
| ESO 472-G015    | 00 04 14 -25 13.3  |                                  |                                     |                                       |                                  |
| ESO 293-G035    | 00 04 19 -42 07    | 110                              | 6.9                                 | 52                                    |                                  |
| ESO 293-G040    | 00 05 00 -37 44.4  | 229                              | 2.7                                 | 31                                    |                                  |
| SDIG            | 00 05 41 -34 51.3  | 1549                             | 9.6                                 | 50                                    | 1551                             |
| UGCA 003        | 00 07 45 -18 32.5  | 367                              | 3.7                                 | 87                                    | 357                              |
| NGC 59          | 00 12 53 -21 43.2  | 1494                             |                                     |                                       |                                  |
| ESO 410-G005    | 00 13 00 -32 27.5  | 4450                             |                                     |                                       |                                  |
| ESO 194-G002    | 00 16 02 -47 56    | 1431                             |                                     |                                       |                                  |
| SC20            | 00 16 07 -24 17    | 1557                             |                                     |                                       |                                  |
| UGCA 005        | 00 16 17 -19 17    | 1435                             |                                     |                                       |                                  |
| SC21            | 00 19 33 -19 07.1  | 1431                             |                                     |                                       |                                  |
| SC22            | 00 21 20 -24 58.7  | 1431                             |                                     |                                       |                                  |
| ESO 410-G011    | 00 22 27 -27 34.2  | 1431                             |                                     |                                       |                                  |
| ESO 294-G010    | 00 24 06 -42 07.8  | 1431                             |                                     |                                       |                                  |
| ESO 473-G020    | 00 24 55 -25 26.5  | 1431                             |                                     |                                       |                                  |
| ESO 410-G012    | 00 25 49 -28 15.3  | 1557                             |                                     |                                       |                                  |
| ESO 473-G024    | 00 28 50 -23 02.6  | 1557                             |                                     |                                       |                                  |
| ESO 294-G020    | 00 29 45 -40 32.3  | 1557                             |                                     |                                       |                                  |
| SC23            | 00 30 53 -22 08.8  | 1557                             |                                     |                                       |                                  |
| ESO 410-G017    | 00 31 10 -28 04.5  | 1557                             |                                     |                                       |                                  |
| SC24            | 00 34 12 -32 50.8  | 1557                             |                                     |                                       |                                  |
| SC25            | 00 34 33 -27 09    | 1557                             |                                     |                                       |                                  |
| AM0035-434      | 00 35 21 -43 46.5  | 1557                             |                                     |                                       |                                  |
| SC26            | 00 37 44 -18 05.7  | 1557                             |                                     |                                       |                                  |
| ESO 540-G012    | 00 37 49 -20 58    | 1557                             |                                     |                                       |                                  |
| SC27            | 00 38 32 -26 32.5  | 1557                             |                                     |                                       |                                  |
| DDO 226         | 00 40 36 -22 31.4  | 1557                             |                                     |                                       |                                  |
| SC28            | 00 41 12 -17 47.8  | 1557                             |                                     |                                       |                                  |
| SC29            | 00 42 43 -25 32.4  | 1557                             |                                     |                                       |                                  |
| ESO 411-G013    | 00 44 42 -31 51    | 1557                             |                                     |                                       |                                  |
| ESO 411-G018    | 00 45 35 -32 15    | 1557                             |                                     |                                       |                                  |
| SC30            | 00 45 56 -25 44.5  | 1557                             |                                     |                                       |                                  |
| ESO 411-G019    | 00 46 41 -29 23.6  | 1557                             |                                     |                                       |                                  |
Table 3—Continued

| Name            | R.A. & Dec. (1950) | $V_\odot$ km s$^{-1}$ | Int. Flux Jy km s$^{-1}$ | $\Delta V_{20}$ km s$^{-1}$ | $V_\odot$ km s$^{-1}$ |
|-----------------|--------------------|------------------------|---------------------------|-----------------------------|------------------------|
| ESO 540-G030    | 00 46 53 -18 20.8  |                        |                           |                             |                        |
| 0047-21         | 00 47 18 -21 56.8  |                        |                           |                             |                        |
| DDO 006         | 00 47 20 -21 17.5  | 304                    | 4.5                       | 58                          |                        |
| ESO 540-G032    | 00 47 56 -20 10.8  |                        |                           |                             |                        |
| ESO 411-G027    | 00 50 26 -27 35.8  |                        |                           |                             |                        |
| SC31            | 00 51 11 -25 44.9  |                        |                           |                             |                        |
| ESO 540-G033    | 00 51 22 -19 49    |                        |                           |                             |                        |
| ESO 351-G029    | 00 57 46 -35 48.6  |                        |                           |                             |                        |
| ESO 541-IG012   | 00 59 51 -19 56    |                        |                           |                             |                        |
| AM0106-382      | 01 06 06 -38 28.4  |                        |                           |                             |                        |
| ESO 195-G032    | 01 07 19 -48 03.5  |                        |                           |                             |                        |
| ESO 243-G050    | 01 08 34 -42 38.5  | 1477                   | 2.2                       | 72                          | 1490                   |
| SC32            | 01 10 27 -38 31.1  |                        |                           |                             | 6607                   |
| SC33            | 01 15 20 -21 56.2  |                        |                           |                             |                        |
| SC34            | 01 19 44 -27 39.7  |                        |                           |                             |                        |
| SC35            | 01 20 11 -26 16    |                        |                           |                             |                        |
| ESO 476-G010    | 01 24 23 -25 34.4  | 1607                   | 4.2                       | 134                         |                        |
| SC36            | 01 24 31 -15 48.5  |                        |                           |                             |                        |
| SC37            | 01 26 32 -41 31.8  |                        |                           |                             |                        |
| ESO 542-G022    | 01 28 50 -17 57.5  |                        |                           |                             | 5442                   |
| SC38            | 01 30 33 -39 46.5  |                        |                           |                             |                        |
| SC39            | 01 31 27 -29 57    |                        |                           |                             |                        |
| ESO 476-G023    | 01 31 29 -25 28    |                        |                           |                             |                        |
| SC40            | 01 31 31 -19 19.7  |                        |                           |                             |                        |
| ESO 476-G023    | 01 31 31 -25 27.9  |                        |                           |                             |                        |
| ESO 353-G017    | 01 31 50 -34 19.9  |                        |                           |                             | 3820                   |
| NGC 625         | 01 32 56 -41 41.4  | 406                    | 32.5                      | 106                         | 415                    |
| SC41            | 01 35 20 -34 48.7  |                        |                           |                             |                        |
| SC42            | 01 37 11 -47 33.1  | 162                    | 8                         | 64                          |                        |
| MCG-03-05-014   | 01 39 09 -16 23.8  | 1632                   | 5.9                       | 143                         |                        |
| SC43            | 01 41 51 -27 55.5  |                        |                           |                             |                        |
| ESO 245-G005    | 01 42 58 -43 50.5  | 399                    | 87.3                      | 94                          | 389                    |
| SC44            | 01 48 00 -17 02.7  |                        |                           |                             |                        |
| Phoenix         | 01 49 02 -44 41.3  | 56                     | 2.4                       | 29                          |                        |
Table 3—Continued

| Name            | R.A. & Dec. (1950) | $V_\odot$ km s$^{-1}$ | Int. Flux Jy km s$^{-1}$ | $\Delta V_{20}$ km s$^{-1}$ | $V_\odot$ km s$^{-1}$ |
|-----------------|--------------------|-----------------------|--------------------------|-----------------------------|------------------------|
| ESO 477-G012    | 01 51 28 -23 21.1  |                       |                          |                             |                        |
| ESO 477-G017    | 01 54 36 -25 46    |                       |                          |                             |                        |
|                 |                    | 1463                  |                          |                             |                        |
Table 4. Catalogue of dwarf candidates for the Centaurus A group.

| Name       | R.A. & Dec. (1950) | $V_{\odot}$ km s$^{-1}$ | Int. Flux Jy km s$^{-1}$ | $\Delta V_{20}$ km s$^{-1}$ | $V_{\odot}$ km s$^{-1}$ |
|------------|------------------|-----------------|----------------|-----------------|----------------|
| ESO 321-G018 | 12 13 10 -37 50 | 3163 | 596 | 31.9 | 103 |
| ESO 322-G015 | 12 24 57 -37 50 | 6763 | 6763 | 6763 |
| ESO 574-G001 | 12 25 55 -21 57.5 | 1809 | 647 | 647 | 647 |
| ESO 218-G012 | 12 37 10 -51 57.5 | 5437 | 5437 | 5437 |
| ESO 268-G033 | 12 39 45 -47 17 | 1910 | 1910 | 1910 |
| ESO 172-G006 | 12 40 21 -52 30.5 | 1910 | 1910 | 1910 |
| ESO 381-G020 | 12 43 16 -33 34 | 599 | 599 | 599 | 599 |
| ESO 443-G001 | 12 51 09 -27 36 | 3187 | 3187 | 3187 |
| ESO 443-G006 | 12 51 55 -31 36 | 3563 | 3563 | 3563 |
| CEN1        | 12 53 50 -42 02 | 2467 | 2467 | 2467 |
| ESO 381-G031 | 12 55 30 -32 56 | 2944 | 2944 | 2944 |
| ESO 323-G054 | 12 56 35 -40 42 | 3584 | 3584 | 3584 |
| ESO 269-G024 | 12 56 40 -42 53 | 3532 | 3532 | 3532 |
| ESO 219-G017 | 12 56 55 -47 59 | 4550 | 4550 | 4550 |
| ESO 323-G056 | 12 57 20 -38 08 | 2115 | 2115 | 2115 |
| CEN2        | 12 58 05 -47 26.5 | 2607 | 2607 | 2607 |
| CEN3        | 12 58 12 -47 27.3 | 2607 | 2607 | 2607 |
| ESO 507-G065 | 12 58 21 -25 49 | 2607 | 2607 | 2607 |
| CEN4        | 12 58 50 -25 55 | 720 | 720 | 720 |
| SGC1259.6-1659 | 12 59 33 -16 58 | 720 | 720 | 720 |
| DDO 161     | 13 00 37 -17 09 | 750 | 750 | 750 |
| CEN5        | 13 02 02 -49 08 | 53 | 53 | 53 |
| CEN6        | 13 02 12 -39 48 | 602 | 602 | 602 |
| ESO 219-G027 | 13 03 39 -49 35 | 112 | 112 | 112 |
| ESO 219-G028 | 13 03 41 -49 25 | 143 | 143 | 143 |
| ESO 508-G004 | 13 04 10 -22 34 | 2896 | 2896 | 2896 |
| ESO 269-G053 | 13 05 57 -42 39 | 2002 | 2002 | 2002 |
| ESO 443-G075 | 13 06 25 -28 22 | 172 | 172 | 172 |
| ESO 219-IG032 | 13 06 30 -47 42.7 | 3489 | 3489 | 3489 |
| UKS 1307-429 | 13 07 10 -42 56 | 2126 | 2126 | 2126 |
| ESO 443-G079 | 13 07 38 -27 42 | 2138 | 2138 | 2138 |
| CEN7        | 13 08 24 -38 38 | 2389 | 2389 | 2389 |
| ESO 443-G080 | 13 08 21 -27 44 | 2137 | 2137 | 2137 |
| ESO 443-G083 | 13 10 10 -32 25 | 2389 | 2389 | 2389 |
| Name          | R.A. & Dec. (1950) | $V_\odot$ km s$^{-1}$ | Int.Flux Jy km s$^{-1}$ | $\Delta V_20$ km s$^{-1}$ | $V_\odot$ km s$^{-1}$ |
|--------------|-------------------|------------------------|--------------------------|---------------------------|------------------------|
| ESO 323-G097 | 13 11 10 -39 00   | 1502                   | 19.3                     | 151                       | 5010                   |
| ESO 508-G030 | 13 12 12 -22 52   |                        |                          |                           |                        |
| ESO 443-G085 | 13 12 25 -32 00   |                        |                          |                           |                        |
| ESO 444-G002 | 13 14 00 -27 37   | 1636                   | 10.2                     | 122                       |                        |
| ESO 382-G030 | 13 14 10 -37 24   |                        |                          |                           |                        |
| ESO 444-G006 | 13 15 43 -31 21   |                        |                          |                           | 3653                   |
| ESO 382-G040 | 13 16 35 -33 00.5 | 1682                   | 14.5                     | 144                       |                        |
| ESO 269-G087 | 13 17 20 -47 25.5 |                        |                          |                           | 3000                   |
| ESO 382-G045 | 13 17 25 -35 46   | 1460                   | 33.6                     | 155                       |                        |
| AM 1317-425  | 13 17 42 -42 50   |                        |                          |                           | 3323                   |
| CEN8         | 13 20 04 -33 17   |                        |                          |                           |                        |
| AM1321-304   | 13 21 49 -30 42   |                        |                          |                           |                        |
| ESO 382-G061 | 13 22 41 -37 07   | 1437                   | 7.3                      | 105                       |                        |
| CEN9         | 13 22 48 -29 49   |                        |                          |                           | 4413                   |
| ESO 576-G059 | 13 23 52 -21 57.5 | 1431                   | 10.2                     | 118                       |                        |
| ESO 220-G011 | 13 24 00 -48 28   |                        |                          |                           | 2925                   |
| ESO 324-G023 | 13 24 36 -37 55   | 1439                   | 71.9                     | 218                       |                        |
| ESO 324-G024 | 13 24 40 -41 13   | 526                    | 52.1                     | 113                       | 524                    |
| CEN10        | 13 26 06 -30 13.5 |                        |                          |                           |                        |
| ESO 444-G059 | 13 27 42 -31 57   |                        |                          |                           |                        |
| ESO 383-G017 | 13 30 25 -34 12   |                        |                          |                           | 3471                   |
| NGC 5206     | 13 30 41 -47 53.7 |                        |                          |                           | 571                    |
| ESO 509-G059 | 13 31 05 -24 30   |                        |                          |                           | 4664                   |
| Fourc-Figu   | 13 31 45 -45 16   | 831                    | 201.6                    | 157                       |                        |
| CEN11        | 13 31 48 -28 58.5 |                        |                          |                           | 1347                   |
| UGCA 365     | 13 33 42 -28 59   | 582                    | 4.6                      | 61                        |                        |
| ESO 444-G084 | 13 34 30 -27 47   | 591                    | 19.6                     | 82                        | 578                    |
| NGC 5237     | 13 34 40 -42 35.5 | 369                    | 7.6                      | 89                        | 371                    |
| ESO 324-G044 | 13 35 15 -39 35   |                        |                          |                           | 2532                   |
| IC 4316      | 13 37 28 -28 38   | 589                    | 7.8                      | 120                       | 589                    |
| NGC 5264     | 13 38 47 -29 39.7 | 487                    | 13.7                     | 84                        | 476                    |
| ESO 220-G032 | 13 38 58 -48 04   | 1364                   | 7.7                      | 114                       |                        |
| ESO 383-G062 | 13 39 05 -35 26   |                        |                          |                           |                        |
| ESO 383-G064 | 13 39 15 -36 06   |                        |                          |                           |                        |
Table 4—Continued

| Name            | R.A. & Dec. (1950) |  $V_{\odot}$  km s$^{-1}$ | Int.Flux Jy km s$^{-1}$ | $\Delta V_{20}$ km s$^{-1}$ |  $V_{\odot}$ km s$^{-1}$ |
|-----------------|--------------------|---------------------------|------------------------|----------------------------|------------------------|
| ESO 509-G096    | 13 40 07 -24 52    |                           |                        |                           | 5467                   |
| ESO 445-G023    | 13 41 52 -29 49    |                           |                        |                           | 4620                   |
| ESO 325-G011    | 13 42 00 -41 36    | 550                       | 25.4                   | 77                        | 554                    |
| ESO 383-G087    | 13 46 20 -35 50    | 333                       | 27.4                   | 68                        | 342                    |
| ESO 383-G091    | 13 47 36 -37 03    | 1077                      | 9.4                    | 155                       |                        |
| ESO 384-G002    | 13 48 28 -33 34    | 1391                      | 65.5                   | 146                       |                        |
| ESO 445-G061    | 13 49 15 -31 35    |                           |                        |                           |                        |
| AM1357-504      | 13 57 30 -50 48.5  |                           |                        | -48$^a$                   |                        |
| CEN12           | 14 00 15 -50 31.5  |                           |                        |                           |                        |
| NGC 5408        | 14 00 17 -41 09    | 506                       | 65.5                   | 123                       | 497                    |
| ESO 446-G020    | 14 06 38 -30 02    |                           |                        |                           | 2629                   |
| ESO 579-G003    | 14 10 48 -17 45    | 1445                      | 20.5                   | 170                       |                        |
| ESO 271-G025    | 14 11 50 -43 43    | 1786                      | 25.2                   | 116                       |                        |
| ESO 222-G001    | 14 15 30 -47 30    | 1284                      | 22.1                   | 170                       |                        |
| ESO 272-G004    | 14 16 00 -45 05    | 1653                      | 20.5                   | 171                       |                        |
| ESO 579-G019    | 14 16 43 -21 31    |                           |                        |                           |                        |
| ESO 446-G053    | 14 18 22 -29 02    | 1391                      | 23.2                   | 169                       |                        |
| ESO 579-G021    | 14 19 15 -18 44    |                           |                        |                           |                        |
| ESO 385-G014    | 14 19 20 -35 48    |                           |                        |                           | 3659                   |
| ESO 222-G004    | 14 20 24 -49 26    | 1555                      | 26.9                   | 115                       |                        |
| ESO 385-G019    | 14 20 45 -35 18    | 3493                      |                        |                           |                        |
| SGC 142448-4604.8| 14 24 48 -46 04.8  | 397                       | 19.5                   | 68                        |                        |
| ESO 511-G050    | 14 28 40 -25 10    |                           |                        |                           | 2555                   |
| ESO 222-G010    | 14 31 42 -49 12.5  | 632                       | 9.1                    | 83                        | 603                    |
| CEN13           | 14 35 15 -46 40    |                           |                        |                           |                        |
| IC 4472         | 14 36 45 -44 06    |                           |                        |                           | 2869                   |
| ESO 272-G025    | 14 40 10 -44 29    |                           |                        |                           | 624                    |
| ESO 222-G015    | 14 41 05 -49 11    |                           |                        |                           | 2254                   |
| ESO 386-G022    | 14 43 52 -35 18    |                           |                        |                           | 6120                   |
| IC 4501         | 14 44 34 -22 12    |                           |                        |                           | 3319                   |
| CEN14           | 14 45 45 -28 07    |                           |                        |                           |                        |
| SGC145501-4730  | 14 55 05 -47 28    | 1056                      | 155                    | 205                       |                        |
| ESO 223-G009    | 14 57 35 -48 04    | 593                       | 96.2                   | 103                       | 593                    |
| NGC 5810        | 14 59 54 -17 40    |                           |                        |                           | 3297                   |
Table 4—Continued

| Name         | R.A. & Dec. (1950) | \(V_\odot\) \(\text{km s}^{-1}\) | Int. Flux \(\text{Jy km s}^{-1}\) | \(\Delta V_{20}\) \(\text{km s}^{-1}\) | \(V_\odot\) \(\text{km s}^{-1}\) |
|--------------|--------------------|-------------------------------|-----------------------------------|----------------------------------|-------------------------------|
| ESO 274-G001 | 15 10 45 -46 36.5  | 528                           | 117                               | 177                              | 507                           |

\(^{a}\)Planetary Nebula
Table 5. Confirmed dwarf galaxies in the Sculptor group.

| Name       | R.A. & Dec. (1950) | $M_{HI}$ (10$^6 M_\odot$) |
|------------|--------------------|-----------------------------|
| SC2        | 23 17 56 -32 10 49 | 15.3                        |
| ESO 347-G017 | 23 24 17 -37 37 18 | 15.4                        |
| UGCA 442   | 23 41 10 -32 13 58 | 82.6                        |
| ESO 348-G009 | 23 46 47 -38 02 55 | 12.4                        |
| SC18       | 23 58 22 -41 25 40 | 6.8                         |
| ESO 293-G035 | 00 04 19 -42 07 01 | 10.2                        |
| SDIG       | 00 05 41 -34 51 24 | 4.0                         |
| NGC 59     | 00 12 53 -21 43 12 | 5.4                         |
| ESO 473-G024 | 00 28 50 -23 02 37 | 11.3                        |
| SC24       | 00 34 12 -32 50 52 | 17.4                        |
| DDO 226    | 00 40 36 -22 31 20 | 11.0                        |
| DDO 006    | 00 47 20 -21 17 27 | 6.6                         |
| AM0106-382 | 01 06 06 -38 28 21 | <2.8                        |
| NGC 625    | 01 32 56 -41 41 24 | 47.8                        |
| SC42       | 01 37 11 -47 33 10 | 11.8                        |
| ESO 245-G005 | 01 42 58 -43 50 33 | 128.4                       |
Table 6. Confirmed dwarf galaxies in the Centaurus A group.

| Name             | R.A. & Dec. (1950) | $M_{HI}$ $(10^6 M_{\odot})$ |
|------------------|-------------------|-----------------------------|
| ESO 381-G020     | 12 43 18 -33 33 54 | 92.0                        |
| SGC1259.6-1659   | 12 59 35 -16 58 13 | 15.0                        |
| DDO 161          | 13 00 38 -17 09 14 | 317.5                       |
| CEN5             | 13 02 02 -49 08 00 | 15.9                        |
| CEN6             | 13 02 12 -39 48 00 | 12.7                        |
| ESO 324-G024     | 13 24 40 -41 13 18 | 150.2                       |
| NGC 5206         | 13 30 41 -47 53 42 | <5.5                        |
| UGCA 365         | 13 33 42 -28 58 54 | 13.3                        |
| ESO 444-G084     | 13 34 32 -27 47 30 | 56.5                        |
| NGC 5237         | 13 34 40 -42 35 36 | 21.9                        |
| IC 4316          | 13 37 29 -28 38 30 | 22.5                        |
| NGC 5264         | 13 38 47 -29 39 42 | 39.5                        |
| ESO 325-G011     | 13 42 01 -41 36 30 | 73.2                        |
| ESO 383-G087     | 13 46 23 -35 48 48 | 79.0                        |
| NGC 5408         | 14 00 18 -41 08 12 | 188.9                       |
| SGC142448-4604.8 | 14 24 48 -46 04 48 | 56.2                        |
| ESO 222-G010     | 14 31 41 -49 12 12 | 26.2                        |
| ESO 272-G025     | 14 40 09 -44 29 36 | <5.5                        |
| ESO 223-G009     | 14 57 35 -48 04 00 | 277.4                       |
| ESO 274-G001     | 15 10 45 -46 36 30 | 337.4                       |
Table 7. Crossing times for the Sculptor and Centaurus A groups

|            | \(\langle r \rangle\) (Mpc) | \(\langle |\Delta V|\rangle\) (km s\(^{-1}\)) | \(t_{cross}\) (years) |
|------------|-----------------------------|---------------------------------|-----------------------|
| Sculptor   | 0.66                        | 127                             | \(3.24 \times 10^9\) |
| Centaurus A| 0.72                        | 100                             | \(4.48 \times 10^9\) |
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Fig. 1.— HI Parkes spectra of detections in the Sculptor region

Fig. 2.— HI Parkes spectra of detections in the Centaurus A region

Fig. 3.— Atlas of dwarf galaxies in the Sculptor and Centaurus A groups, from enlarged SRC J plates (always North at the top, East to the left). The scale is indicated on the first Plate for the Sculptor galaxies and on the last for the Centaurus A ones.

Fig. 4.— Distribution in R.A.-Dec of the Sculptor (top) and Centaurus A (bottom) groups members (the small filled circles indicate the dwarf members).

Fig. 5.— Declination versus \( V_{LG} \) (velocity relative to the Local Group, in km s\(^{-1}\)) for members of the groups and for background detections. Triangles indicate main members, filled squares dwarf members and open squares background objects.

Fig. 6.— Cumulative velocity histograms, where \( \Delta V \) is the velocity of a dwarf member relative to that of the center of mass of the group.

Fig. 7.— For each dwarf galaxy is plotted its relative velocity versus its projected distance from the center of mass of the Sculptor group (left) and the Centaurus A group (right).
