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Research Note

The globular cluster system of NGC 1399

IV. Some noteworthy objects

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Abstract. We present 8 bright globular clusters and/or objects of less familiar nature which we found in the course of scrutinizing the globular cluster system of NGC 1399. These objects are morphologically striking, either by their sizes or by other structural properties. Some of them may be candidates for stripped dwarf galaxy nuclei, emphasizing the possible role of accretion in the NGC 1399 cluster system. They are all highly interesting targets for further deep spectroscopy or HST-imaging. Since these objects have been found within an area of only $42'^2$, we expect many more still to be detected in a full census of the NGC 1399 cluster system.

Key words. galaxies: elliptical and lenticular, cD – galaxies: individual: NGC 1399 – galaxies: star clusters

1. Introduction

NGC 1399 is the central galaxy in the Fornax cluster. Due to its proximity (19 Mpc) and richness, its globular cluster system is one of the most attractive cluster systems to study (for a compilation of literature on NGC 1399 see the introduction of Dirsch et al. 2003).

How such rich GCSs of giant elliptical galaxies have formed, is intimately linked to the formation history of the host galaxy itself. Several possibilities have been discussed: Tidal stripping of globular clusters (GCs) by encounters of neighbouring galaxies (Kissler-Patig et al. 1999), accretion of GCs through the accretion of dwarf galaxies (Hilker et al. 1999b; Côté et al. 1998), formation of GCs in merger events (Ashman & Zepf 1992), in-situ formation during collapse (Forbes et al. 1997).

In particular the brightest objects attract closer scrutiny. In NGC 1399, GC-like objects as bright as $M_V \approx -13$ mag have been identified (Hilker et al. 1999a; Drinkwater et al. 2000) which Phillips et al. (2001) labelled "Ultracompact Dwarfs" (UCDs). Do these objects simply constitute the bright wing of the globular cluster luminosity function (Mieske et al. 2002) or were they formed by processes different from those forming "normal" globular clusters? Recent spectroscopic identification of new compact Fornax members around NGC 1399 by Mieske et al. (2004) rather support the latter hypothesis by finding an overdensity for bright objects with respect to the globular cluster luminosity function. Accretion of dwarf galaxies as donators of globular clusters has first been considered by Zinnecker et al. (1988). Meanwhile, much evidence for this has been found in the Galactic system with the cases of the Sagittarius dwarf galaxy (e.g. Ibata et al. 1997) and ω Centauri (e.g. Hilker et al. 2004, and references therein). Some of the brightest clusters in NGC 5128 are also suspected to be stripped nuclei of dwarf galaxies (Martini & Ho 2004).

If nuclei of former dwarf galaxies make up a significant proportion of the bright objects in NGC 1399 (Karick et al. 2003; Mieske et al. 2004), one expects to find evidence for that for example in form of faint appendages hinting to tidal processes.

We studied the GCS of NGC 1399 both photometrically, by wide-field imaging (Dirsch et al. 2003) and spectroscopically (Richtler et al. 2004; Dirsch et al. 2004) to a larger extent as has been done before. In the course of this campaign, we have gained VLT images in excellent seeing, resolving many

⋆ Based on observations collected with the VLT at the European Southern Observatory, Cerro Paranal, Chile; ESO program 66.B-0393.

globular clusters and revealing structures which went unnoticed until now.

In this paper, we present a list of some of our brightest GCs showing under various aspects some sort of peculiarity regarding their sizes or other structural properties. Our aim is to draw the community's attention to these interesting objects in order to investigate their properties further by better spatial or spectroscopic resolution.

2. Observations

The spectroscopic observations, which resulted in radial velocities of about 470 objects, have been obtained with FORS2 and the Mask Exchange Unit (MXU) at ESO's Very Large Telescope in the period 11/29/2000−12/1/2000. The grism was 600B, resulting in a resolution of about 4 Å. These observations are described in Dirsch et al. 2004. During this campaign, two FORS2 fields (area $6.5' \times 6.5'$) have been imaged in V and I in excellent seeing (0.6 arcsec), resulting in marginal resolution of many GCs. These images are already documented in Dirsch et al. (2003). The images have been exposed for 300 s in both V (Bessell V) and I (Bessell I). A few objects are well resolved and in some cases show faint large extensions or irregular shapes. These are the objects, which we list here. The quoted Washington photometric values are taken from Dirsch et al. (2003), who used the 4 m CTIO telescope equipped with the MOSAIC camera to obtain wide-field photometry in Washington C1 and Kron-Cousins R.

3. Morphological description

The objects which we present have been found by visual inspection of the PSF-subtracted images. Most faint structure are better or only visible on the V-frame due to the much lower sky background with respect to the I frame. The PSF subtraction works excellent, removing also bright stars and leaving only faint residuals. Many of the bright globular clusters, which can be spectroscopically identified, leave much brighter residuals than stars of comparable or even distinctly higher brightness. Of course, the resolution is not good enough to measure except for the largest ones reliable structural parameters, but it demonstrates that large GCs can be identified by ground-based data out to a distance of 20 Mpc. In NGC 1399, Larsen et al. (2001) measured effective radii with HST, but the present FORS fields do not overlap with the HST-fields. Here we select only objects which are particularly striking.

For estimating Washington metallicities, we used the calibration formula given by Harris & Harris (2002):

$$[\mathrm{Fe/H}] = -6.04 \times (1 - 0.82(C - T1) + 0.16(C - T1)^2).$$

3.1. ISHAPE

ISHAPE is a code designed to measure the best fitting shape parameters of an object by iteratively convolving an analytic model with the point spread function (PSF) (Larsen 1999). Here we choose a King model with a concentration parameter of 30, which has been applied to HST-observations

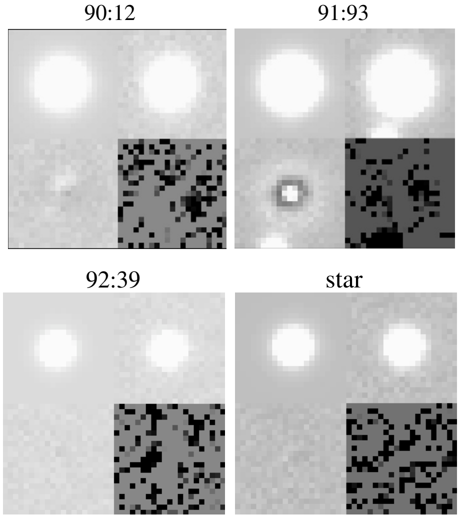

Fig. 1. The figure shows the ISHAPE-residuals for 90:12 and 91:93 (*upper panels*). Displayed in each panel are the model convolved by the PSF (*upper left*), the object (*upper right*), the residual (*lower left*), and the weighting array (*lower right*). The residuals show that 90:12 is somewhat asymmetric and that a King30 profile might be not the best representation of 91:93. For comparison, we also show the residuals for an unresolved globular cluster (92:39, *lower left*) and a star of approximately $R = 19$ mag.

of NGC 1399 clusters before (Larsen et al. 2001) (named King30-profile in the following). The model reads

$$\mu(r) \sim \left(\frac{1}{\sqrt{1 + (\frac{r}{r_c})^2}} - \frac{1}{\sqrt{1 + (\frac{r_t}{r_c})^2}} \right)^2,$$

$\mu(r)$ being the surface brightness, r_c the core radius, and r_t the tidal radius.

The code gives the full-width-at-half-maximum (*FWHM*) and chi-square values of the model fit. Moreover, it returns the chi-square values of a convolution of a delta-function with the PSF. This is useful for an assessment, how well a given object is resolved. In our case the *FWHM* is always much smaller than the PSF (except for one object), so the resulting values cannot be accurate, but rather first guesses of their magnitudes. For all objects, we used a fitting radius of 10 pixels. Table 2 lists the values for our objects. The effective radii are of course model dependent and have been calculated by adopting r_t as the radius containing the total brightness. The corresponding central surface brightnesses are very uncertain and only can indicate a trend. More comments are given in the individual descriptions. For comparison, we give the fit values also for an unresolved globular cluster (92:39) and a 19th mag (R-band) star. In both cases ISHAPE returns a stellar appearance. Here the chi-square values of the King30 models are meaningless. The delta-function chi-square values are very small, indicating an excellent fit. Figure 1 illustrates for 90:12 and 91:93 (UCD2), how the quality of the fits can be assessed. The upper left panel for each object displays the model, the upper right panel the image, the lower left panel the residual, and the lower right panel the weighting scheme (black means low weight). More comments are given in the individual descriptions. In addition,

Table 1. The identification of objects uses the numbering of Dirsch et al. (2004). The label FCOS is adapted from Mieske et al. (2002, 2004), the label UCD from Drinkwater et al. (2003). We list coordinates and Washington colours as well from Dirsch et al. They are not available for two objects. V and I photometry may not be more accurate than 0.1 mag, since no nightly calibration has been done. We used the standard zeropoints and neglected colour terms. Three objects are found only on the preimages and have no V, I photometry assigned. Radial velocities are from Dirsch et al. Remarks refer to crossidentifications or peculiarities.

object	RA[2000]	Dec[2000]	T1	C-T1	V	$V-I$	rad.vel.	Remarks
75:85	3 38 50.37	−35 22 07.8	20.83 ± 0.02	1.78 ± 0.03	21.45	1.14	1609 ± 24	extended
78:12	3 38 58.49	−35 26 28.1	19.92 ± 0.02	1.26 ± 0.03	20.54	0.84	1048 ± 18	resolved, appendix
80:115	3 38 16.64	−35 20 22.9	19.78 ± 0.03	1.40 ± 0.04			1432 ± 20	only on V-preimage, large
89:22	3 38 17.53	−35 33 02.5	?	?	20.49	0.85	1514 ± 26	well resolved
89:33	3 38 19.02	−35 32 22.1	20.52 ± 0.02	1.60 ± 0.03	21.2	0.97	1650 ± 34	
90:12	3 38 14.80	−35 33 39.5	?	?	21.18	0.79	1565 ± 24	large!, FCOS 2-2072
92:74	3 38 00.16	−35 30 08.5	20.57 ± 0.04	1.46 ± 0.04	21.09	0.93	820 ± 10	on galaxy?, FCOS 2-2100
91:93	3 38 06.27	−35 28 58.7	18.80 ± 0.04	1.62 ± 0.05	19.57	0.93	1239 ± 14	UCD2, FCOS 2-2111
FCOS 1-063	3 38 56.14	−35 24 49.1	19.79 ± 0.02	1.37 ± 0.03	20.54	0.94	688 ± 45	

Table 2. This table lists the results of ISHAPE and the corresponding effective radii and central surface brighnesses in the V-band. The latter values are rough estimates only, using the relations quoted by Larsen (2001). A King30 model has been applied. The difference between the χ^2-values for a King profile and a Delta-function indicates the degree of resolution.

object	χ^2(King-model/Delta-function)	*FWHM* [″]	$r_{\rm eff}$[pc]	$\mu_0(V)$[mag/arcsec^2]
75:85	marginally resolved			
78:12	13/60	0.08	11	16.4
89:22	8/40	0.08	11	16.3
89:33	7/11	0.05	7	
90:12	25/125	0.2	27	19.0
92:74	not resolved			
91:93	35/298	0.10	16	15.9
FCOS 1-063	35/91	0.08	11	16.3
92:39	2.6/2.4	stellar		
star	2.6/2.4	stellar		

we give the residuals for the two unresolved objects. Only tiny residuals are left.

3.2. Description of objects

Our spectra were designed to give radial velocities, not line indices. Therefore, most of them are too noisy to say anything about abundances or ages. In Fig. 3 four spectra of the brighter objects are displayed. They are not flux-calibrated (the relative intensity rather reflects the spectrograph's flat field) and are shifted conveniently. Indicated are the individual shifts. In the following description, we refer a few times to Balmer line strengths.

Object 75:85 This object is marginally resolved by ISHAPE, which may be caused by its superposition on a faint, elongated structure, pointing towards N-E. The PSF-subtraction does not show a remnant. Washington colours indicate a metallicity of −0.3 dex. Aperture photometry gives for the appendage a $V-I$ colour being 0.2 ± 0.2 mag redder than the object itself, still consistent with having the same colour. However, the appendage is very faint and the colour measurement might be not reliable. Although one cannot exclude that the object is superimposed on a faint background galaxy, it is a candidate for a bright globular cluster with a striking tidal tail.

Object 78:12 This object is stunning. The PSF-subtraction uncovers a large halo, extending on our image to about 3″ to the North, corresponding to 270 pc, which clearly is a lower limit. The effective radius of 11 pc only refers to the core. For comparison, ω-Centauri has an effective radius of 6.4 pc, but with an absolute magnitude of $M_V = -10.5$ is only 0.4 mag fainter. The central surface brightness consequently is low, but still normal for globular clusters. The V-image shows two faint structures, one going in the N-W direction, the other, like a tiny "spiral arm" to the S-W. The N-W structure is also visible on our MOSAIC R-image. It is hardly visible on the VLT I-image probably due to the much higher sky background. The metallicity from Washington photometry is −1.3 dex. The spectrum shows strong Balmer lines. Hγ is much stronger than the neighbouring G-band, which one rather finds for very metal-poor clusters. However, higher spectroscopic S/N is needed for any

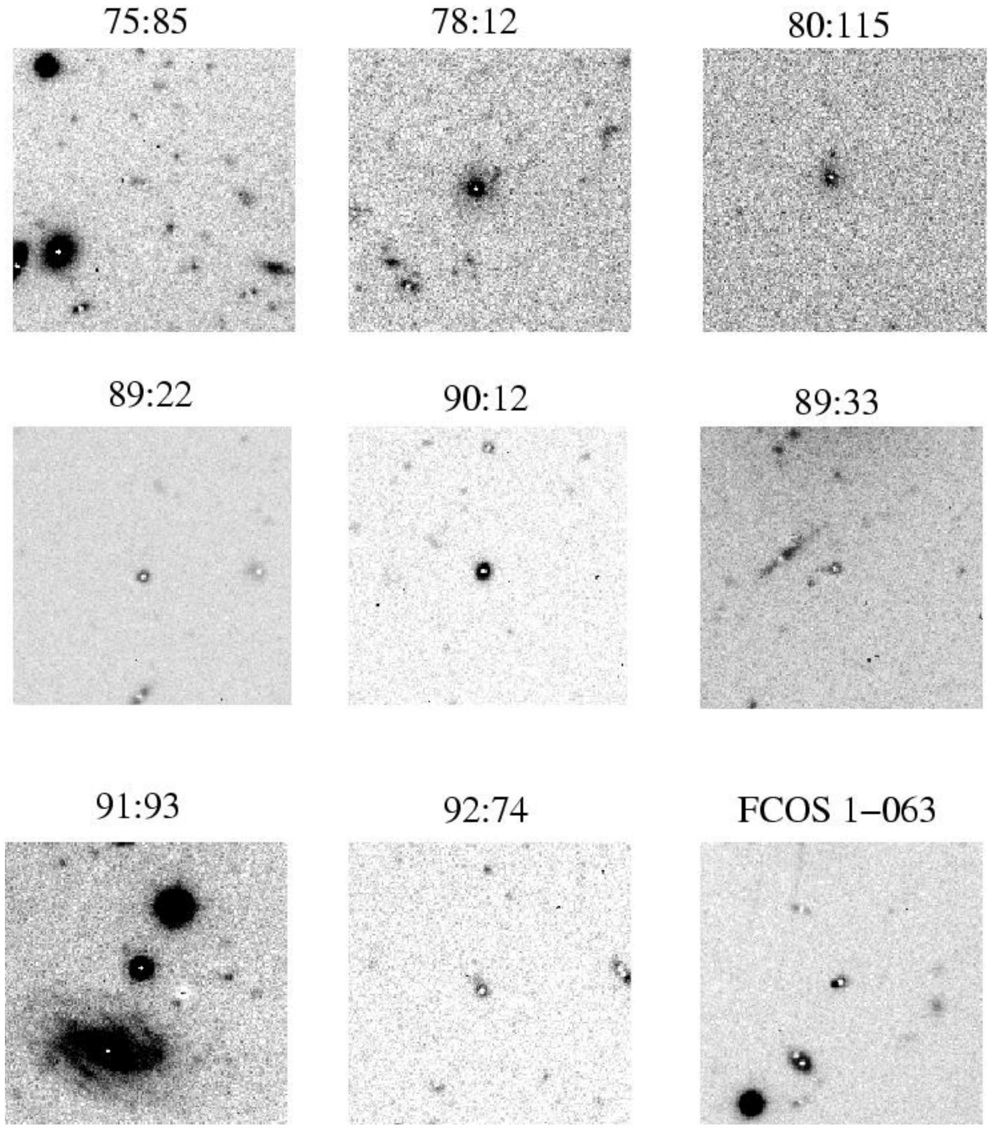

Fig. 2. Centered on the objects, these images show the residuals of 9 objects after PSF subtraction. The size of each image is 35″ × 35″. North is up, East to the left. See the text for individual descriptions.

attempt to determine its age. In total, 78:12 does not resemble neither a globular cluster nor a dwarf galaxy and apparently is a candidate for an initially larger but strongly distorted/stripped nucleated dwarf galaxy.

Object 80:115 This object only appears on our V-preimage, which has been exposed for 30 s (seeing 0.7″). Deeper imaging is not available, thus the S/N is not sufficient for ISHAPE to work reliably. The PSF subtraction however shows a remnant with an approximate diameter of 2″. The real extent is presumably much larger and may even be larger than that of 78:12 given the short exposure time. The Washington metallicity is −1.2 dex and the Balmer lines are less strong than in the case of 78:12.

Object 89:22 Washington photometry of this resolved object is not available. The $V - I$ colour indicates a metal-poor object, while the Balmer lines are only moderately strong. It looks compact, without a visible halo. The diameter is roughly 2″, corresponding to 180 pc. The effective radius according to ISHAPE is as large as that of 78:12. It could be a fainter version of an UCD (Drinkwater et al. 2003).

Object 89:33 89:33 is only marginally resolved, as are many objects on our frames. It is interesting by showing a faint appendage, perhaps a tidal tail?

Object 90:12 This is the object for which ISHAPE found the largest *FWHM*. It appears slightly elliptical. We estimate its total extension along the major axis to be at least 350 pc according to the remnant of the PSF subtraction. The effective radius is 27 pc, larger than those of the majority of the UCDs (Drinkwater et al. 2003). Mieske et al. (2004) quote 1331 ± 149 km s^{-1} for its radial velocity, deviating by about 2-sigma from our value.

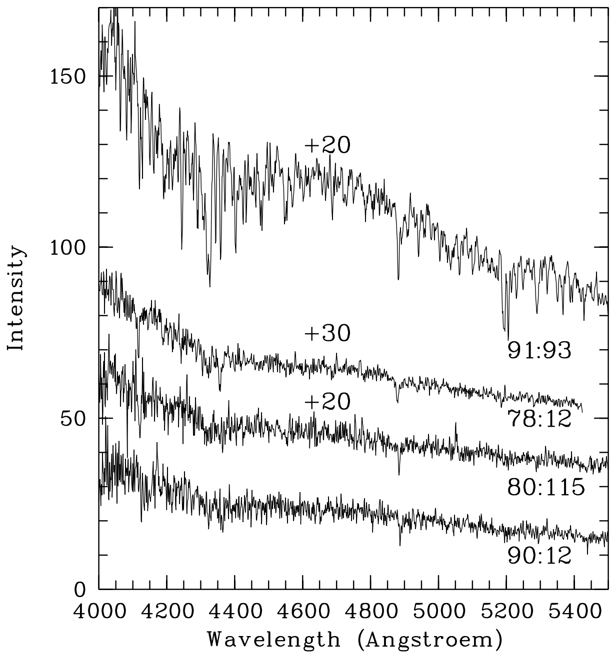

Fig. 3. Four spectra of the brightest objects are plotted in the wavelength range 4000 Å−5500 Å. The spectra are not flux calibrated and are shifted (except for 90:12) to permit a convenient display. Individual shifts are indicated. Except perhaps for 91:93, they are too noisy to measure line indices. However, the high metallicity of 91:93 and the strong Balmer lines of 78:12 are striking. The "emission" in 80:115 at 5050 Å is an artefact.

It can be seen in Fig. 1 that the spherically symmetric model leaves a residual. Apparently, the object is asymmetric. No Washington photometry exists, but among our objects it has the bluest $V - I$ colour, pointing to a strong metal deficiency. The spectrum is noisy, but the Balmer lines appear not much weaker as those of 78:12. The spatial resolution is good enough for an estimation of the central surface brightness. A value of $\mu_0(V) \approx 19$ mag/arcsec^2 is quite low for a globular cluster. We estimate the central mass density using formula (7) of Larsen (2001) and get $\rho_0 \approx 170\,M_\odot\,\mathrm{pc}^{-3}$ for an adopted $(M/L)_V$ of 4. There are just few galactic globular clusters having lower central mass densities. This combination of size and surface brightness, however, does not exist for any known cluster (see Fig. 7 of Huxor et al. 2005).

Object 91:93 This is one of the UCDs (UCD 2), which has been imaged by HST (Drinkwater et al. 2003; de Propris et al. 2005). The Washington metallicity is −0.6, which excellently fits to the metallicity given by Mieske et al. (2002) derived from line indices. We show the spectrum for illustration, which is typical for a metal-rich globular cluster. This object gives us the possibility to compare the effective radius of ISHAPE with the more reliable one of HST. de Propris et al. (2005) quote an effective radius of 20.3 pc so our value of 16 pc (which is model dependent) shows that a King profile with $c = 30$ measures its extension only approximately. Figure 1 shows a residual. It is symmetric but our King30 model underestimates the brightness of the central parts and the outer regions, while overestimating the brightness in an intermediate region. However, our central surface brightness of $\mu_0(V) \approx 16.3$ mag/arcsec^2 fits fits well to the profile of de Propris et al.

The remnant of the PSF has a diameter of about 3″, corresponding to 280 pc. No halo is visible but there is a faint structure at the N-E, too faint to measure its colour reliably. Deeper images could provide colour measurements in order to see whether this is a faint background galaxy. Mieske et al. (2004) quote 1280 ± 58 km s^{-1} for its radial velocity which agrees with our value within the uncertainty.

Object 92:74 The Washington metallicity of this object is −0.9. ISHAPE resolves it marginally. It is superimposed on a faint elongated structure pointing towards N-E, the length being approximately 3 arsec. This structure is marginally visible on our *R*-frame and not visible on the *I*-frame. Like 75:85, it may be a candidate for showing a bright tidal tail. Mieske et al. (2004) quote 997 ± 152 km s^{-1} for its radial velocity and thus agrees with our more accurate value.

FCOS 1-063 Mieske et al. (2002) list this object as a globular cluster. Our image immediately reveals its elongation. The subtraction of the PSF further shows that it actually consists of two sources, superimposed on a larger structure with major and minor axes of approximately 2.5 and 1.5 arcsec of length, corresponding to 140 kpc and 230 kpc, respectively. The secondary object is 2 mag fainter than the primary. No difference in $V - I$ color can be detected. It still could be a superimposed star but in conjunction with its other peculiarities it would be a quite strange coincidence.

The Washington color indicates a metallicity of −1.1. The absolute magnitude is $M_V = -11$. The radial velocity relative to NGC 1399 is almost 800 km s^{-1}. If we assume (very probable incorrectly) that the radial component represented the full orbital velocity around NGC 1399 the object was at its perigalactic distance. This is the miminal space velocity which is possible relative to NGC 1399. Already then it must have an extremely elongated orbit (Richtler et al. 2004). The radial separation from NGC 1399 is 6 arcmin, corresponding to a perigalactic distance of 33 kpc. The apogalactic distance is then about 200 kpc (see Fig. 20 of Richtler et al. 2004). The true space velocity relative to NGC 1399 probably is higher and the apogalactic distance larger than 200 kpc. Then the question arises whether such object can be bound to NGC 1399 or rather should be considered as an interlooper bound only to the entire Fornax cluster.

4. Discussion

The main aim of our presentation is to call the community's attention to the present objects. Given that almost all have been found on two FORS fields only after a modest exposure time, the cluster system of NGC 1399 must host a multitud of similar objects. Extended speculations on the nature of these sources are inappropriate but a few remarks may be given.

What is the nature of the secondary point source in the case of FCO 1-063? Its association with the main source is unclear, although likely. It can be a candidate for a nucleus of a stripped dwarf galaxy with one globular cluster, which survived tidal stripping. One is tempted to think of a cluster merging with the nucleus, as predicted by Oh & Lin (2000) and Lotz et al. (2001). Long-slit spectroscopy in excellent seeing would prove/disprove its association with FCO 1-063.

The interpretation of UCD's discovered by Drinkwater et al. (2000) and Hilker et al. (1999a) as remnants of dwarf galaxies may also hold for fainter objects. Depending on the initial configuration and the details of the interaction process, "galaxy threshing" (Karick et al. 2003; Bekki et al. 2001, 2003) may produce a large variety of morphological appearance, the UCDs only being the brightest ones. However, de Propris et al. (2005) compared surface brightness profiles of UCDs and dwarf galaxy nuclei and found the latter to have systematically lower central surface brightnesses,weakening the case for galaxy threshing. Regarding their central surface brightness, our objects, except 90:12, resemble fainter versions of UCDs rather than dwarf galaxy nuclei. 90:12 and perhaps 80:115 (where deeper observations are required) seem to be quite different from UCDs.

The role of accretion of dwarf galaxy nuclei might thus be important in giant ellipticals, particularly for a central giant elliptical like NGC 1399. This is also interesting in the following context: Bimodal colour distributions are common in globular cluster systems. However, although the bimodality in NGC 1399 is very pronounced it disappears for the bright end of the luminosity function (Dirsch et al. 2003) indicating that this population has a different history than the bulk of the fainter clusters. The sample of bright compact objects of Mieske et al. (2004) emphasizes this point again.

Another possibility is that Blue Compact Dwarf galaxies (BCDs) may be progenitors. An interesting object in that respect is POX 186 (e.g. Kunth 1981; Corbin & Vacca 2002; Guseva et al. 2004). Such extremely compact star-forming dwarf galaxies may well develop into objects like 78:12 or 80:115 after star formation has ceased. The formation of "super star clusters" and perhaps their subsequent merging (Fellhauer & Kroupa 2002) does not need a merger of large spiral galaxies, but also occurs in BCDs (e.g. Vanzi 2003). Dwarf galaxies may therefore contribute in various ways to the population of bright and compact objects. Also the "faint fuzzies" in lenticular galaxies (Brodie & Larsen 2003) and the recently discovered globular clusters with large (30 pc) effective radii in M 31 (Huxor et al. 2005) show that the morphology of globular clusters is much broader than previously thought. The brightnesses of our objects are compatible with the bright tail of the luminosity function of GCs in NGC 1399 (e.g. Dirsch et al. 2003). Once a statistically significant sample of these objects has been assembled, one can compare their luminosity function with that of GCs (for a recent review see Richtler 2003) and search for differences.

It is therefore of high interest to perform a complete census around NGC 1399. HST with the Advanced Survey Camera would of course be preferable, but ground-based imaging with a seeing of 0.5″ is also feasible and probably would uncover many more interesting and surprising objects.

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References

Ashman, K. M., & Zepf, S. E. 1992, ApJ, 384, 50
Bekki, K., Couch, W. J., & Drinkwater, M. J. 2001, ApJ, 552, L105
Bekki, K., Couch, W. J., Drinkwater, M. J., & Shioya, J. 2003, MNRAS, 344, 399
Brodie, J. P., & Larsen, S. S. 2002, AJ, 124, 1410
Corbin, M. R., & Vacca, W. D. 2002, ApJ, 581, 1039
Côté, P., Marzke, R. O., & West, M. J. 1998, ApJ, 501, 554
de Propris, R., Phillipps, S., Drinkwater, M., et al. 2005, ApJ, 623, L105
Dirsch, B., Richtler, T., Geisler, D., et al. 2003, AJ, 125, 1908
Dirsch, B., Richtler, T., Geisler, D., et al. 2004, AJ, 127, 2114
Drinkwater, M. J., Jones, J. B., Gregg, M. D., & Phillips, S. 2000, PASA, 17, 227
Drinkwater, M. J., Gregg, M. D., Hilker, M., et al. 2003, Nature, 423, 519
Fellhauer, M., & Kroupa, P. 2002, MNRAS, 330, 642
Forbes, D. A., Brodie, J. P., & Grillmair, C. J. 1997, AJ, 113, 1652
Guseva, N. G., Papaderos, P., Izotov, Y. I., Noeske, K. G., & Fricke, K. J. 2004, A&A, 421, 519
Harris, W. E., & Harris, G. L. H. 2002, AJ, 124, 1435
Hilker, M., Infante, L., Vieira, G., et al. 1999a, A&AS, 134, 75
Hilker, M., Infante, L., & Richtler, T. 1999b, A&AS, 138, 55
Hilker, M., Kayser, A., Richtler, T., & Willemsen, P. 2004, A&A, 422, L9
Huxor, A. P., Tanvir, N. R., Irwin, M. J., et al. 2005, MNRAS, in press [arXiv:astro-ph0412223]
Ibata, R. A., Wyse, R. F. G., Gilmore, G., et al. 1997, AJ, 113, 634
Karick, A., Drinkwater, M. J., & Gregg, M. D. 2003, MNRAS, 344, 188
Kissler-Patig, M., Grillmair, C. J., Meylan, G., et al. 1999, AJ, 117, 1206
Kunth, D., Sargent, W. L. W., & Kowal, C. 1981, A&AS, 44, 229
Larsen, S. S. 1999, A&A, 354, 836
Larsen, S. S. 2001, AJ, 122, 1782
Larsen, S. S., Brodie, J. P., Huchra, J. P., et al. 2001, AJ, 121, 2974
Lotz, J. M., Telford, R., Ferguson, H., et al. 2001, ApJ, 552, 572
Martini, P., & Ho, L. C. 2004, ApJ, 610, 233
Mieske, S., Hilker, M., & Infante, L. 2002, A&A, 383, 823
Mieske, S., Hilker, M., & Infante, L. 2004, A&A, 418, 445
Oh, K. S., & Lin, D. N. C. 2000, ApJ, 543, 620
Phillips, S., Drinkwater, M. J., Gregg, M. D., & Jones, J. B. 2001, ApJ, 560, 201
Richtler, T. 2003, in Stellar Candles for the Extragalactic Distance Scale, ed. D. Alloin, W. Gieren (Springer), Lect. Notes Phys., 635, 281
Richtler, T., Dirsch, B., Gebhardt, K., et al. 2004, AJ, 127, 2094
Vanzi, L. 2003, A&A, 408, 523
Zinnecker, H., Keable, C. J., Dunlop, J. S., et al. 1988, in Globular Cluster Systems in Galaxies, ed. J. E. Grindlay, & A. G. D. Philip, IAU Symp., 126, 603