Two confirmed compact elliptical galaxies in the Antlia cluster

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Abstract. We confirm the existence of two compact elliptical (cE) galaxies in the central region of the Antlia cluster through MAGELLAN-MIKE and GEMINI-GMOS spectra. Only about a dozen galaxies of this rare type are known today up to a distance of 100 Mpc. With this finding, Antlia becomes the nearest galaxy cluster harbouring more than one cE galaxy among its galaxy population. One of these galaxies shows evidence of interaction with one of the giant ellipticals that dominate the central region of the cluster.

Resumen. A través de espectros obtenidos con MAGALLANES-MIKE y GEMINI-GMOS, confirmamos la existencia de dos galaxias de tipo compacta elíptica (cE) en la región central del cúmulo de Antlia. Sólo se conocen alrededor de una docena de galaxias de este raro tipo hasta la fecha, y hasta una distancia de 100 Mpc. Con este hallazgo Antlia se convierte en el cúmulo de galaxias más cercano en presentar más de una cE entre sus galaxias miembro. Una de estas galaxias muestra evidencia de interacción con una de las galaxias elípticas gigantes que dominan la región central del cúmulo.

1. Introduction

1.1. The Antlia cluster

The Antlia cluster is the third nearest galaxy cluster after Virgo and Fornax. Dirsch et al. (2003) calculated a distance modulus of $(m - M) = 32.73$, which translates into a distance of 35.2 Mpc. Sandage (1975) described Antlia as a beautiful small group dominated by the two equally bright E galaxies NGC 3258 and NGC 3268. He noticed that its galaxy population consists of a few spiral galaxies among its Es and S0s. Ferguson & Sandage (1990, hereafter FS90) identified 375 galaxies within a projected area of $\sim 8$ Mpc$^2$ that are listed in the FS90 Antlia Group Catalogue. Only 6% of these galaxies had redshift information at that moment. FS90 confirmed the elongated structure of Antlia, already
noticed by Hopp & Materne (1985). They also estimated that its central galaxy
density is 1.7 times higher than in Virgo and 1.4 times higher than in Fornax.

Antlia’s galaxy population was poorly studied until we began our Antlia
Cluster Project. This is a long-term project aimed at performing a large-scale
photometric and spectroscopic study of the galaxy content of the cluster. Our
previous results refer to the globular cluster (GC) systems of NGC 3258 and
NGC 3268 (Dirsch et al. 2003, Bassino et al. 2008), and to the early-type galaxy
population in the central region of the cluster (Smith Castelli et al. 2008a,b,
hereafter Paper I and Paper II, respectively; Smith Castelli 2008).

1.2. Compact elliptical galaxies

Compact elliptical (cE) galaxies constitute a very rare type of objects as only
about a dozen have been identified up to a distance of 100 Mpc (e.g. Chilingarian
et al. 2007, 2009; Price et al. 2009). The prototype of this class is M32 (but
see Graham 2002) and their main characteristics are a high central and effective
surface brightness for their luminosities, and a high degree of compactness. Most
of the known examples are placed close in projection to giant galaxies. FS90
classified 11 objects as possible cE galaxies in the Antlia cluster. Two of them
are members of the cluster but their morphologies do not match that of cE
systems.

In this contribution we present two newly confirmed FS90 cE galaxies in
Antlia (namely, FS90 110 and FS90 192). Each of them is close in projection
to one of the giant ellipticals NGC 3258 and NGC 3268 (Fig. 1). A photometric
analysis was presented in Paper II. In that work, both galaxies were considered
as firm candidates to be genuine cEs due to their photometric characteristics,
similar to those of confirmed cEs. It is interesting to find new members of this
class in the nearby Universe as it has been proposed that cE galaxies are the
low-mass counterparts of giant ellipticals (Kormendy et al. 2009).

2. Observations

MAGELLAN-MIKE echelle spectra of FS90 110 and FS90 192 were obtained at
the CLAY telescope of Las Campanas Observatory in 2009 March 27 and 28
(program ID: LCO-CNTAC09A_042). Slits of 1 x 5 arcsec and binning 2 x 3
were used. The spectral coverage at the red side of the echelle spectrograph was
4900-10000 Å, with a resolution (fwhm) of ~ 0.35 Å. For FS90 110, two spectra of
900 sec and one of 2400 sec were obtained, and only one of 2400 sec for FS90 192.
The reduction was performed using a combination of the imred.ccdred.echelle
and mtools packages within IRAF.

We have also obtained GEMINI-GMOS multi-object spectra for three fields
placed in the central region of Antlia. FS90 110 was located in one of these
fields. The data were taken during January and March 2009 at the Gemini-
South Observatory (program ID: GS-2009A-Q-25, PI: L. Bassino, 8 hours in
Band I). We used a slit width of 1 arcsec, and the B600_G5303 grating blazed at
5000 Åwith three different central wavelengths (5000, 5050 and 5100 Å) in order
to fill in the CCD gaps. The wavelength coverage is 3500 - 7200 Å, depending
on the positions of the slits, and the resolution (fwhm) is ~ 4.6 Å. The total
3. Preliminary Results

Through the identification of the more prominent absorption lines (i.e. H$_\alpha$, Na and MgI) on the red side of the echelle spectra, we have obtained preliminary radial velocities of $\sim$ 2900 km s$^{-1}$ for FS90 110, the neighbour of NGC 3258, and $\sim$ 2500 km s$^{-1}$ for FS90 192, the cE companion of NGC 3268 (Fig. 2). We consider Antlia members those galaxies displaying radial velocities in the range 1200 – 4200 km s$^{-1}$ (Paper I, Faifer et al. 2008). The value obtained for FS90 110 has been confirmed through our GMOS spectra and it is consistent with the radial velocity of NGC 3258 ($\sim$ 2800 km s$^{-1}$, Paper I). It is interesting to recall that FS90 110 shows a low surface brightness bridge that seems to link it to NGC 3258 (Paper II). With these findings Antlia becomes the nearest galaxy cluster hosting more than one cE galaxy among its galaxy population. In addition, FS90 110 is the only cE showing clear evidence of interaction with its bright companion. We will present a detailed spectroscopic and additional photometric analysis of these new cE galaxies in a forthcoming paper (Smith Castelli et al. in preparation).

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Figure 2. Echelle MAGELLAN-MIKE spectra of FS90 110 (top) and FS90 192 (bottom) showing the position displayed by H$_\alpha$ (6562.82 Å). The spectrum of FS90 110 is shifted upwards in order to avoid superposition with that of FS90 192. Both spectra are not flux calibrated.

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