Globular Clusters in the Central Region of Nearby Galaxy Clusters

Michael Hilker
Sternwarte der Universität Bonn, Auf dem Hügel 71, 53121 Bonn, Germany, email: mhilker@astro.uni-bonn.de

Abstract.
In this contribution, first results of deep VLT photometry (V, I) in the central region of the Hydra I and Centaurus galaxy clusters are presented. In both galaxy clusters, many star clusters have been identified down to the turnover magnitude of the globular cluster luminosity function at $V \approx 26.0$ mag. They are distributed not only around the several early-type galaxies, but also in the intra-cluster field, as far as 250 kpc from the cluster centers. Outside the bulges of the central galaxies in Hydra I and Centaurus, the intra-cluster globular cluster system is dominated by blue clusters whose spatial distribution is similar to that of the (newly discovered) dwarf galaxies.

1. Introduction and data
The centers of galaxy clusters are the densest regions of galaxy populations in the Universe. They are the places where the most frequent interactions between galaxies are expected to have taken place during the cluster formation epoch (and maybe also in the present). Some striking properties of galaxy cluster centers are: 1) a very rich globular cluster system (GCS) around the central galaxy (e.g. Harris 1991), 2) an extended stellar halo (cD halo) around the central galaxy (e.g. Schombert 1988), and 3) an abundant population of early-type dwarf galaxies clustered towards the center (e.g. Ferguson & Binggeli 1994). How do these findings come together? Can they be the result of a common scenario in which galaxy disruption played a major role (see Hilker et al. 1999)? Nearby galaxy clusters provide an ideal laboratory to study the different stellar components in detail.

The Hydra I Galaxy cluster is dynamically evolved, has a regular core shape and an isothermal X-ray gas halo that can be followed out to about 160 kpc. The Centaurus cluster is dynamically young with two merging sub-groups, a main cluster component (Cen30) around the cD galaxy NGC 4696 and a smaller group component (Cen45) around NGC 4709. Both galaxy clusters are located at a distance of about 45 Mpc.

Both galaxy clusters were observed at dark time and under photometric conditions in the filters $V$ and $I$ with FORS1 at the VLT (ESO, Paranal). The seeing in all fields was in the range 0.5 to 0.7 arcsec, thus providing a very homogeneous data set.
2. First results and future work

As one can see in Fig. 1, globular cluster candidates are spread all over the core of the two galaxy clusters, well outside the tidal radii of the central galaxies. The red GCs ($1.0 < (V-I) < 1.25$) are more concentrated towards the galaxy’s bulges than the blue GCs ($0.8 < (V-I) < 1.0$). The intra-cluster GCs are not uniformly distributed around the central galaxies. In the Centaurus cluster, they show a tidal tail-like structure between the two dominant giant ellipticals. In Hydra I, they occupy the same space as the abundant (newly found) dwarf spheroidal galaxies. Also there exists a population of very blue ($0.6 < (V-I) < 0.8$), probably young clusters close to NGC 3311. These clusters might have been stripped from the late-type group of galaxies around NGC 3312 that is passing by the core of Hydra I. In both clusters, a population of very bright ($-11 < M_V < -13$) cluster or compact dwarf galaxy candidates seems to exist.

In the near future we intend to 1) construct a density map of the intra-cluster GC population, in order to define its center and compare it to that of the X-ray gas halo, 2) model the cD halo light to study the local specific frequency all over the galaxy cluster, 3) study in detail the individual GCSs of all member galaxies down to the dwarf galaxy regime, and 4) confirm the membership of dwarf galaxies and bright compact objects by follow-up spectroscopy.

References

Ferguson, H. C., Binggeli, B. 1994, A&AR 6, 67
Harris, W. E. 1991, ARA&A 29, 543
Hilker, M., Infante, L., Richtler, T. 1999, A&AS 138, 55
Schombert, J. M. 1988, ApJ, 328, 475