3. SIZE DISTRIBUTION

For the star clusters size measurements we use the ISHAPE program (Larsen 1999). ISHAPE convolves analytic profiles with the surface brightness distribution of a cluster with different effective radii with the Point-Spread Function (PSF) and then fits these to each source in the data. The best fitting $R_{\rm eff}$ is determined by minimizing the χ^2 in an interactive process. This method is able to obtain reliable $R_{\rm eff}$ for $R_{\rm eff} \geq 0.02$ pc, as determined using field stars in the images. In this case, we fit a King model with a concentration index $c = 30$. The characteristic PSF used by ISHAPE was derived selecting isolated stars uniformly distributed over the entire field that contains the star cluster, in total 29 fields in the B filter. At this stage, we used the photometry routine IRAF/DAOPHOT (Stetson 1987), with aperture size of 5 pix, meanwhile the local background was measured in an annulus with an inner radius of 10 pix and 5 pix wide.

The effective radii ($R_{\rm eff}$, the radius which contains half of the integrated light) distributions of M81 CSCs are showed in the top of Figure 1. It can be seen that there are important differences in the size distributions of young and globular clusters. The young cluster size distribution shows that there are a large number of very compact clusters with $R_{\rm eff} < 0.5$ pc dropping down at bigger values, whereas the globular cluster distribution is flatter. Young clusters are typically around 7 times smaller that the globular clusters, with the former having a median $R_{\rm eff} = 0.26$ pc, and the latter with median $R_{\rm eff} = 1.9$ pc. The range of young cluster sizes is similar to the range found in other galaxies like LMC and M51 (Mackey & Gilmore 2003; Scheepmaker et al. 2007).

In lower panel of Figure 1, we show the size distribution of M81 and MW globular clusters. We have 120 objects in M81 and 130 in the MW (van den Bergh 1996). Comparing the two distributions we can see that are similar between $1.0 < R_{\rm eff} < 8.5$ pc. M81 has an excess of very compact ($R_{\rm eff} < 1.0$ pc) globular clusters. The median value of M81 globular clusters $R_{\rm eff} = 1.9$ pc is marginally smaller than the MW median size $R_{\rm eff} \sim 2.6$ pc, the latter for Galactic globular clusters with $R_{\rm eff} < 8.5$ pc.

4. CONCLUSIONS

We present the size distributions of M81 compact star clusters, obtained using the ISHAPE routine. We find that there are differences in the size distribution between young compact star clusters and globular clusters. The globular cluster distribution is flatter and wider than the one for young clusters. The sizes of young star clusters are similar to that found in the LMC and M51, whereas the size distribution of M81 globular clusters is very similar to that of the Milky Way.

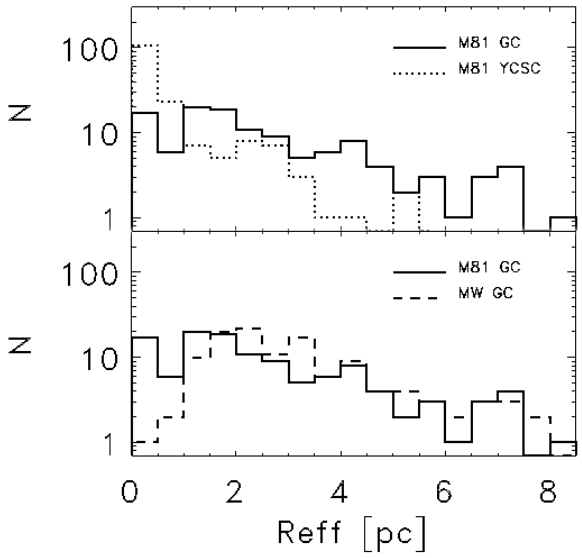

Fig. 1. Effective radii $R_{\rm eff}$ distributions of compact star clusters. M81 young star cluster (Dotted line), M81 globular cluster (continuous line) and Milky Way globular cluster distribution (dashed line).

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