THE DISTRIBUTION OF BRIGHT STARS IN THE SMC CLUSTERS

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Star counts can be used to investigate radial distribution of stars of different mass. Relaxation through stellar encounters is a mechanism that does make a distrinction between stellar masses, so systems that have undergone such relaxation should show differences in distribution between stars of high and low mass. That does not happen for systems that have undergone an initial violent relaxation since this type of relaxation treats all masses equally.

Twenty five disk, three intermediate and eighteen halo clusters of the SMC were measured for studying the segregation effect by means of star counts. Short and long exposure red plates (IIIaF+RG630) were used, taken with the 1.2m U.K. Schmidt telescope. On the short exposure plates (15min) the counted stars reach a limiting magnitude of V~19.30, whereas the deep plates (90 min) reach a magnitude of V~21.00 mag.

Then to compare the distributions of the stars of different masses, the counts from the short exposure plates have been shifted vertically until they overlapped with the counts from the deep plates in the outer region of the cluster. This has been done because the tidal cut off, that determines the tidal radii of these clusters, treats all stars equally and so that in the outer regions of the clusters the distribution of stars should be the same (Da Costa, 1982).

Most of the clusters studied here do not support the mass segregation effect and their diagrams resemble the diagram of the cluster L57 illustrated in Fig. 1a. Only two disk and two halo clusters show evidence of mass segregation and one of those L9 is illustrated in Fig. 1b.

As it was pointed out by King (1975) the bright stars are expected to be studied in the core but are two few to give good statistic in the envelope, while the faint stars are well observed in the envelope but cannot be resolved in the core. Only in globular clusters of low central concentration we can observe faint stars in the centre and this is

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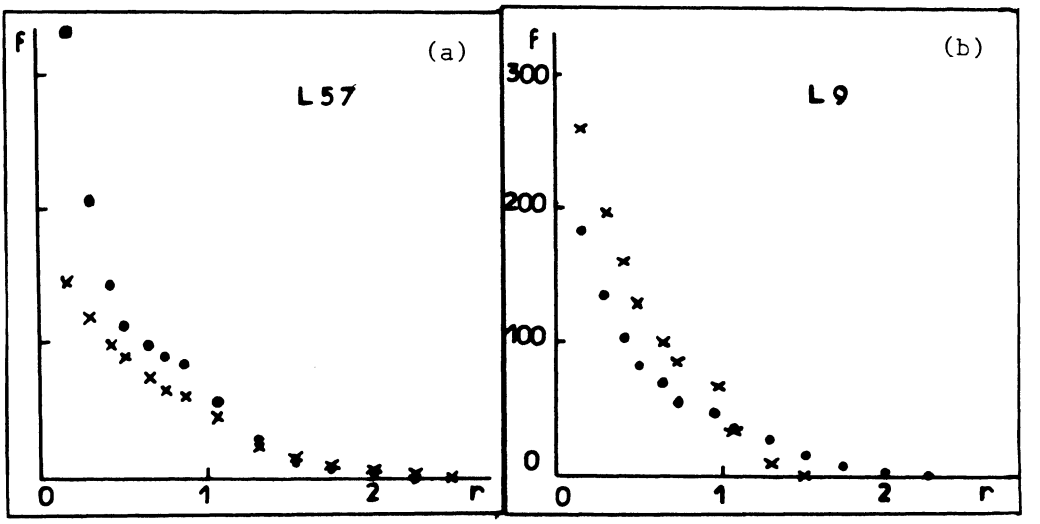

Fig. 1: Radial distribution of stars, $f = \frac{N}{A} - b$ for the clusters: (a) L57 and (b) L9. Circles represent counts from plate (R) and crosses from plate (SR).

rather the case for the SMC clusters. The concentration parameters of these clusters (Kontizas, 1985; Kontizas et al 1985) do not show any relation with mass segregation, at least up to the central area of the cluster with $r<0.10\ r_t$.

From theoretical models it is known that the segregation effect is most striking for the highly concentrated clusters but this is not the case for the SMC clusters, where $\log r_t/r_c$ has values 1.0 to 1.5. From the above it can be assumed that the observed values of the SMC cluster's central concentrations are rather low to show this effect and/or most of them have undergone violent initial relaxation.

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References

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