The R136 star cluster hosts several stars whose individual masses greatly exceed the accepted 150 Msun stellar mass limit

Paul A Crowther (1), Olivier Schnurr (1, 2), Raphael Hirschi (3, 4), Norhasliza Yusof (5), Richard J Parker (1), Simon P Goodwin (1), Hasan Abu Kassim (5)

1=Sheffield, 2=AIP, 3=Keele, 4=Tokyo, 5=Malaya

Spectroscopic analyses of H-rich WN5-6 stars within the young star clusters NGC 3603 and R136 are presented, using archival HST & VLT spectroscopy, & high spatial resolution near-IR photometry. We derive high T* for the WN stars in NGC 3603 (T*~42+/-2 kK) & R136 (T*~53+/-3 kK) plus clumping-corrected dM/dt ~ 2-5x10^-5 Msun/yr which closely agree with theoretical predictions. These stars make a disproportionate contribution to the global budget of their host clusters. R136a1 alone supplies ~7% of N(LyC) of the entire 30 Dor region. Comparisons with stellar models calculated for the main- sequence evolution of 85-500 Msun suggest ages of ~1.5 Myr & M_init in the range 105 - 170 Msun for 3 systems in NGC 3603, plus 165-320 Msun for 4 stars in R136. Our high stellar masses are supported by dynamical mass determinations for the components of NGC 3603 A1. We consider the predicted L_X of the R136 stars if they were close, colliding wind binaries. R136c is consistent with a colliding wind binary system. However, short period, colliding wind systems are excluded for R136a WN stars if mass ratios are of order unity. Widely separated systems would have been expected to harden owing to early dynamical encounters with other massive stars in such a dense environment. From simulated star clusters, whose constituents are randomly sampled from the Kroupa IMF, both clusters are consistent with a tentative upper mass limit of ~300 Msun. The Arches cluster is either too old, exhibits a deficiency of very massive stars, or more likely stellar masses have been underestimated - M_init for the most luminous stars in the Arches cluster approach 200 Msun according to contemporary stellar & photometric results. The potential for stars greatly exceeding 150 Msun within metal-poor galaxies suggests that such pair-instability SNe could occur within the local universe, as has been claimed for SN 2007bi (abridged).

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See also http://www.eso.org/public/news/eso1030/ from Wed 21 from noon (CEST)

Email: Paul.Crowther@sheffield.ac.uk