The resolved stellar populations in the LEGUS galaxies[1]

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1801.05467 The Legacy ExtraGalactic UV Survey (LEGUS) is a multiwavelength Cycle 21 Treasury program on the Hubble Space Telescope. It studied 50 nearby star-forming galaxies in five bands from the near UV to the I-band, combining new Wide Field Camera 3 observations with archival Advanced Camera for Surveys data. LEGUS was designed to investigate how star formation occurs and develops on both small and large scales, and how it relates to the galactic environments. In this paper we present the photometric catalogs for all the apparently single stars identified in the 50 LEGUS galaxies. Photometric catalogs and mosaicked images for all filters are available for download. We present optical and near UV color-magnitude diagrams for all the galaxies. For each galaxy we derived the distance from the tip of the red giant branch. We then used the NUV color-magnitude diagrams to identify stars more massive than 14 $M_{\odot}$, and compared their number with the number of massive stars expected from the GALEX FUV luminosity. Our analysis shows that the fraction of massive stars forming in star clusters and stellar associations is about constant with the star formation rate. This lack of a relation suggests that the time scale for evaporation of unbound structures is comparable or longer than 10 Myr. At low star formation rates this translates to an excess of mass in clustered environments as compared to model predictions of cluster evolution, suggesting that a significant fraction of stars form in unbound systems

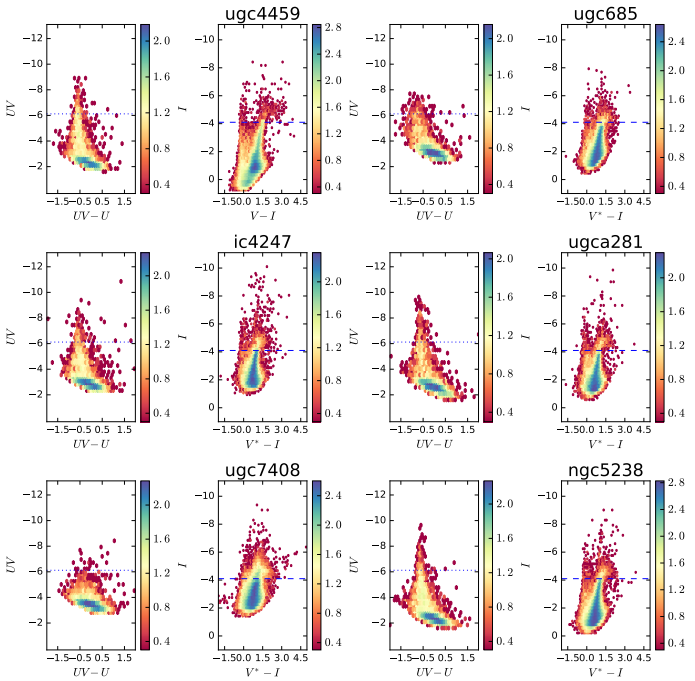

Fig. 5: NUV and optical CMDs for the galaxies UGC4459, UGC685, IC4247, UGCA281, UGC7408, and NGC5238. Magnitudes marked as V* refer to the filter F606W, instead of F5555W.

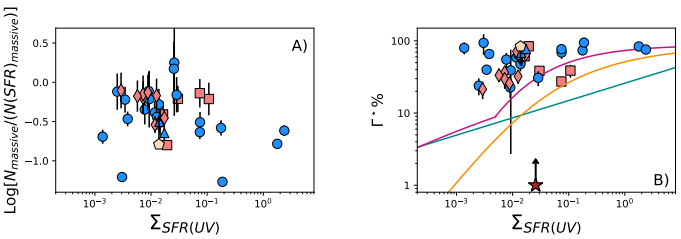

Fig. 4: *Panel A)*: Ratio between the number of stars above 14 $M_{\odot}$ as counted from the LEGUS data and the expected number of stars more massive than 14 $M_{\odot}$ as derived from the measured SFRs as a function of Σ_{SFR}. *Panel B)*: Fraction of stars that likely formed in clustered environments as a function of Σ_{SFR}. As in Figure **??** spiral galaxies are in orange and dwarf galaxies are blue. Spiral galaxies that fit within the WFC3 FoV are marked with square symbols, while for spirals significantly larger than the WFC3 FoV we used diamond symbols. NGC 1566, for which we have only a lower limit is marked with a yellow pentagon. Circles represent dwarf galaxies that fit within the WFC3 FoV, while larger dwarfs are indicated with triangles. The red stars in Panel B mark the two targets (IC 4247 and UGCA 281) whose number of stars counted in the field exceeds the number of stars expected from the SFR. Our data are compared to analytical predictions for the values of Γ, derived assuming a constant (yellow line **?**), and variable gas surface density (**?**, magenta line), and to a fitted relation obtained from observational *Gamma* values (cyan line **?**).

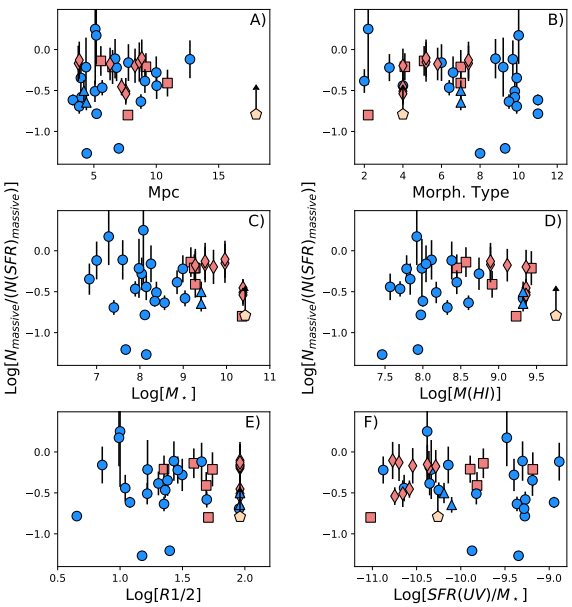

Fig. 3: *Panel A)*: Ratio between the number of stars above 14 $M_{\odot}$ as counted from the LEGUS data and the expected number of stars more massive than 14 $M_{\odot}$ as derived from the measured SFRs as a function of distance (*Panel A)*), morphological type (*Panel B)*), total stellar mass (*Panel C)*), mass of gas (*Panel D)*), UV half light radius (*Panel E)*) and sSFR (*Panel F)*). Spiral galaxies are marked in orange and dwarf galaxies are marked in blue. Spiral galaxies that fit within the WFC3 FoV are marked with square symbols, while spirals significantly larger than the WFC3 FoV are marked with diamonds. Similarly, dwarf galaxies that fit in the WFC3 FoV are indicated by circles, while