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The Nature of E+A Galaxies in Intermediate Redshift Clusters

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Abstract Combining HST/WFPC2 mosaics with extensive ground-based spectroscopy, we study the nature of E+A galaxies in three intermediate redshift clusters (z=0.33, 0.58, & 0.83). From a sample of ~500 confirmed cluster members, we isolate 47 E+A candidates to determine the E+A fraction and study their physical properties. We find E+A's comprise a non-negligible component (~7-13%) of the cluster population at these redshifts, and their diverse nature indicates a heterogeneous parent population. While cluster E+A's are predominantly disk-dominated systems, they span the range in Hubble type and bulge-to-total fraction to include even early-type members. Cluster E+A's also cover a wide range in luminosity (L_B< 2.5L_B*), internal velocity dispersion (<250kms), and half-light radius (<5h^(-1) kpc). From their velocity dispersions and half-light radii, we infer that the descendants of E+A's in our highest redshift cluster are massive early-type galaxies. In contrast to the wide range of luminosity and internal velocity dispersion spanned by E+A's at higher redshift, only low mass E+A's are found in nearby clusters, e.g. Coma. The observed decrease in the characteristic E+A mass is similar to the decrease in luminosity of rapidly star-forming field galaxies since z~1, i.e. galaxy “down-sizing." In addition, we argue our statistics imply that >30% of the E-S0 members have undergone an E+A phase; the true fraction could be 100% if the effects of E+A down-sizing, an increasing E+A fraction with redshift, and the conversion of spirals into early-types are also considered.