TABLE 1

FIT PARAMETERS

Parameter	All	Blue	Red
$\log M_{0,h}$	11.97	11.99	11.87
$\log M_s^*$	10.40	10.30	10.40
β	0.34	0.37	0.18
α	1.45	0.90	1.50
γ	0.90	0.90	0.90
a $(M_s < M_s^*)$	0.000	0.125	0.000
a $(M_s > M_s^*)$	0.095	0.125	0.093

are shown in Figure 6, with solid curves of blue color (blue galaxies) and red color (red galaxies). For comparison, the corresponding relations plotted in Figure 5 are reproduced here (dot-dashed blue and red lines, respectively). One sees that the corrections to the *HMF* we have introduced for associating halos to the blue and red galaxy sub-samples act in the direction of reducing the differences among them in the $M_{\rm s}$–$M_{\rm h}$ ($f_{\rm s}$–$M_{\rm h}$) relations, specially for larger masses. The group/cluster mass function correction to the *HMF* hosting central blue galaxies is the dominant one. The dashed blue and red curves show such a case, where only this correction (and a small re-normalisation) is applied.

3.2.1. *Analytical fits to the stellar-halo mass relations*

From the comparison of the *GSMF* and *HMF* it is easy to deduce that high- and low-mass galaxies have significantly different $M_{\rm s}$–$M_{\rm h}$ scalings, a fact attributed to the different feedback/gas accretion mechanisms dominating in large and small systems (see e.g., Benson et al. 2003). The transition point between the low- and high-mass scalings defines a characteristic halo mass $M_{0,h}$ and an associated stellar mass M_s^*. Therefore, it was common to describe the $M_{\rm s}$–$M_{\rm h}$ relation as a double-power law with the turnover point at $M_{0,h}$. However, BCW10 have argued recently that a power-law at the high-mass side is conceptually a bad description for the $M_{\rm s}$–$M_{\rm h}$ relation and proposed a modification to it. Our results show indeed that a power-law is not sufficient to describe the high-mass side of the $M_{\rm s}$–$M_{\rm h}$ relations.

We have found that a good analytical description to the overall, blue, and red mean $M_{\rm s}$–$M_{\rm h}$ relations inferred here can be obtained for the inverse of the relations ($M_{\rm h}$ as a function of $M_{\rm s}$, as in BCW10), by proposing a power-law dependence for low masses and a sub-exponential law for high masses (see BCW10). The functional form that fits

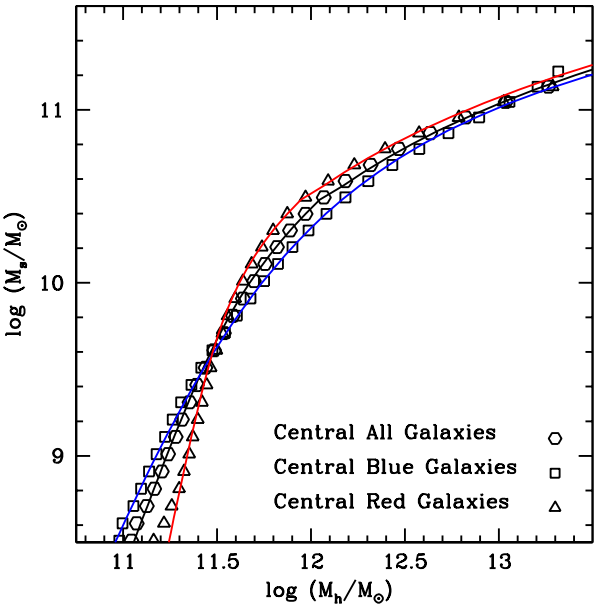

Fig. 7. Analytical fits given by equation (5) and Table 1 compared to the mean $M_{\rm s}$–$M_{\rm h}$ relation obtained here for all central galaxies (black solid line) and the central blue (blue solid line) and red (red solid line) galaxy subsamples. The color figure can be viewed online.

well the three $M_{\rm h}$–$M_{\rm s}$ relations is:

$$M_h = \frac{M_{0,h}}{2^\gamma}\left[\left(\frac{M_s}{M_s^*}\right)^{\beta/\gamma} + \left(\frac{M_s}{M_s^*}\right)^{\alpha/\gamma}\right]^\gamma 10^{a(M_s/M_s^*-1)}, \quad (5)$$

where β regulates the behavior of the relation at masses $M_{\rm s} < M_s^*$, α together with the sub-exponential term ($a < 1$) regulate the behavior at masses $M_{\rm s} > M_s^*$, and γ regulates the transition of the relation around M_s^*. In Table 1 are given the values of all the parameters that best fit our results for the (central) overall, blue, and red $M_{\rm s}$-$M_{\rm h}$ relations. Note that a assumes two different values depending on whether the mass is smaller or larger than M_s^*.

Figure 7 shows the three mean $M_{\rm s}$–$M_{\rm h}$ relations obtained here and the functional form given in equation (5) with the corresponding parameters reported in Table 1. The functional form is an excellent fit to the overall and blue $M_{\rm s}$–$M_{\rm h}$ relations at all masses and to the red $M_{\rm s}$–$M_{\rm h}$ relation for masses larger than $M_{\rm h} \approx 10^{11.3}\ M_\odot$.

3.3. *The baryonic-halo mass relations for central blue and red galaxies*

The right upper and lower panels of Figure 5 show the mean $M_{\rm b}$–$M_{\rm h}$ and $f_{\rm b}$–$M_{\rm h}$ relations, as in the left panels, for all central galaxies (solid line),