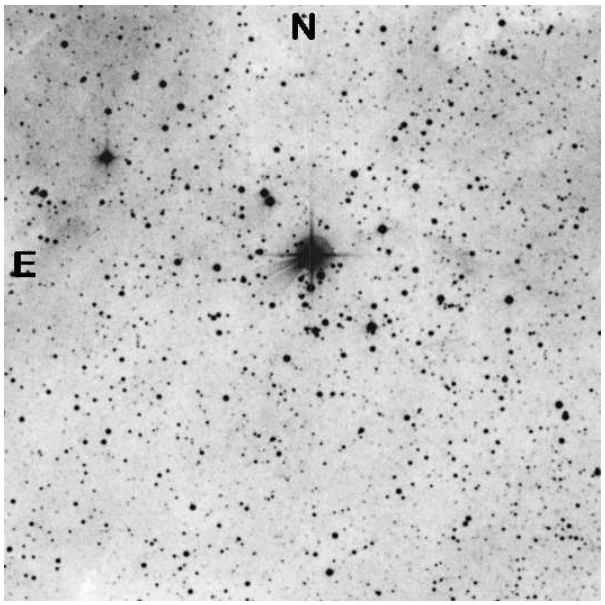

Fig. 8. The $15' \times 15'$ field of Collinder 419 from the Palomar Observatory Sky Survey red image of the field. The image is centered on 2000 co-ordinates: 20:18:08, +40:42:42, the adopted cluster center. HD 193322 is the bright star north of the center of the image.

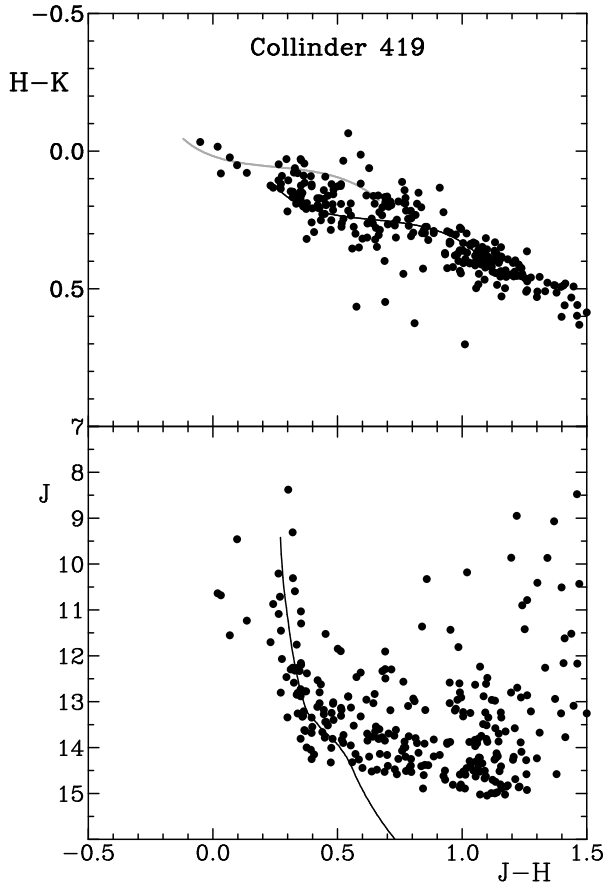

Fig. 9. JHK_s photometry for stars within $5'$ of the adopted center for Collinder 419 with uncertainties smaller than ±0.05. The intrinsic color-color relation is depicted in gray, while the intrinsic relations for $E(J–H) = 0.39$ ($E(B–V) = 1.32$) and $J–M_J = 11.7$ ($V_0–M_V = 10.75$) are shown as black lines.

group from its angular diameter, while Gies et al. (2010) used astrometric and photometric data from the UCAC3 catalogue for bright stars in the field to derive a distance of $d = 741 \pm 36$ pc, with a reddening of $E(B–V) = 0.37 \pm 0.05$. Included as a possible member of the group was the M3 III star IRAS 20161+4035.

The cluster does not stand out well at optical wavelengths, but we were able to detect a slight density enhancement visually and estimate a crude center of symmetry at 2000 co-ordinates: 20:18:08, +40:42:42, close to the coordinates estimated by Collinder. The cluster also appears as a set of reddened B-type stars in available 2MASS JHK_s photometry for stars lying within $5'$ of that center of symmetry (Figure 9), reasonably consistent with Collinder's inferred dimensions. A best fit by eye to the JHK_s data yields a reddening of $E(J–H) = 0.39 \pm 0.02$ ($E(B–V) = 1.32 \pm 0.07$), significantly larger than the value estimated by Gies et al. (2010), a distance modulus of $J–M_J = 11.7 \pm 0.2$ ($V_0–M_V = 10.75 \pm 0.28$), and an inferred distance of $d = 1.42 \pm 0.18$ kpc, which is also larger than the Gies et al. (2010) value, although consistent with a location within the young complex of stars and H II regions (including Berkeley 87, Turner et al. 2010) associated with the Cygnus X region at ~ 1.2 kpc. In this case the 2MASS data provide a more solid basis for the reality of the group than the UCAC3 data, although they do not address the possible membership of HD 193322.

The cluster does not show up as a significant density enhacement from star counts, and it is conceivable that Collinder 419 represents merely a clump in one of the many OB associations seen along the direction of the Cygnus arm.

4. DISCUSSION

Table 2 summarizes the results of the present study of four open clusters using 2MASS observations. Most of the inferred parameters for the clusters differ from published results tied to optical photometry, although those for Turner 1b were considered as an alternate possibility in the study by