P. Kroupa 1995 MNRAS 277, 1491

the observational consequences of the dynamical evolution of star-forming aggregates, making use of the simulations performed in papers K1 and K2.

The observational constraints on orbital parameters are discussed in Section 2. We introduce our models in Section 3. In Section 4 we perform inverse dynamical population synthesis to isolate a possible dominant mode of star formation that may lead to the population of Galactic field stars. By correcting the main-sequence distribution of orbital elements for the dynamical evolution in the dominant-mode cluster we derive an initial period distribution in Section 5. In Section 6 we discuss our findings and Section 7 presents our conclusions.

2 THE OBSERVATIONAL CONSTRAINTS ON ORBITAL PARAMETERS

In Fig. 1 we reproduce the distribution of periods, f_P, for G, K and M dwarf systems. It is evident that f_P does not significantly depend on spectral type. The total proportion of late-type binary systems in the Galactic disc amounts to $f_{tot}^{obs} = 0.47 \pm 0.05$, which is a weighted average of the proportion of binaries among G, K and M dwarfs, respectively: $f_G = 0.53 \pm 0.08$, $f_K = 0.45 \pm 0.07$ and $f_M = 0.42 \pm 0.09$ (see Leinert et al. 1993 and Fischer & Marcy 1992 for the compilation of these numbers – note that a weighted average is not a strictly correct estimate of f_{tot}, but suffices for our purpose; f_{tot} is defined by equation 2 below, see also equation 7). In the top panel of Fig. 2 we show the

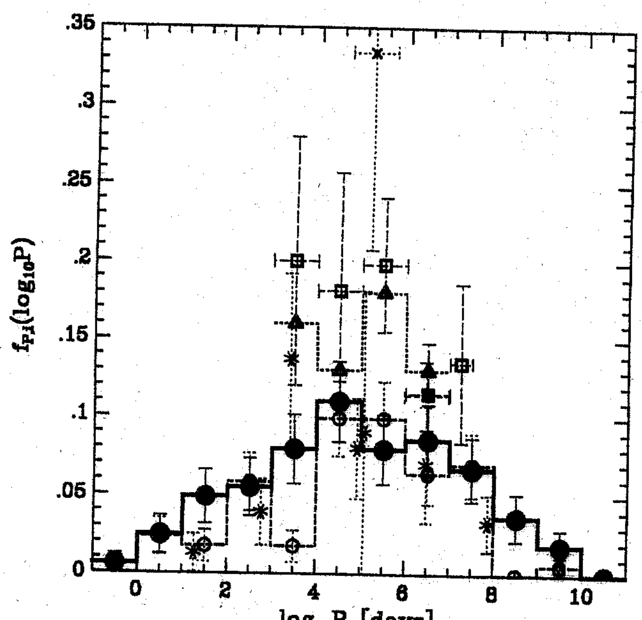

Figure 1. Collation of all currently available data on the period distribution of late-type binary systems (Section 2). Solid dots show the distribution of orbits for solar-mass main-sequence binary systems (Duquennoy & Mayor 1991), open circles indicate the preliminary distribution of periods for K dwarf main-sequence binary systems (Mayor et al. 1992) and asterisks represent M dwarf binaries (Fischer & Marcy 1992). The area under each distribution is the proportion of orbits among all G, K and M stellar systems. The distribution of orbital periods of low-mass pre-main-sequence stars, obtained by transforming from the projected separations, is shown by open triangles (Simon 1992), open squares (Leinert et al. 1993; Richichi et al. 1994), open star (Reipurth & Zinnecker (1993) (on top of an open square at $\log_{10}P = 6.5$) and cross (Ghez et al. 1993). The proportion of pre-main-sequence binaries with $\log_{10}P < 2$ is indistinguishable from the Galactic field distribution (Mathieu 1992, 1994).

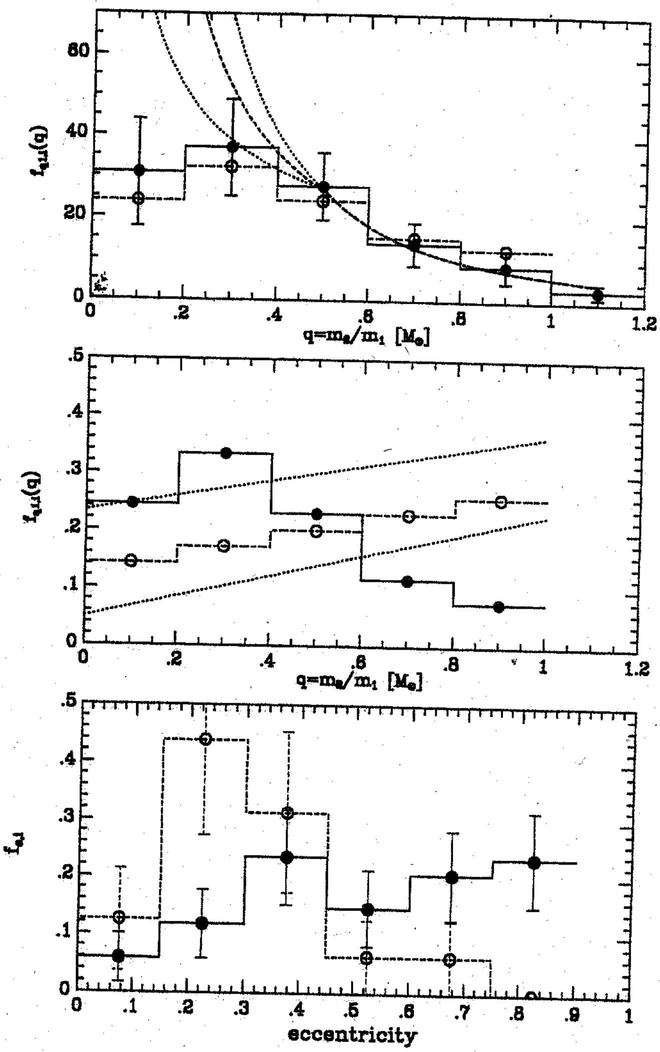

Figure 2. Top panel: the distribution of mass ratios for main-sequence solar-type systems of all periods (Section 2). The filled dots show the distribution derived by Duquennoy & Mayor (1991). The open circles denote their mass-ratio distribution corrected here for the bias in short-period binaries (Mazeh & Goldberg 1992) by adding the corrected short- and long-period distributions shown in the middle panel. The upper dotted, middle dashed and lower dotted curves represent the KTG(α_1) mass function with $\alpha_1 = 1.85$, 1.3, 0.7 (equation 1), respectively, which is the 95 per cent confidence interval for α_1 (Kroupa et al. 1993). The units of the ordinate are the number of systems per bin. Middle panel: the corrected distribution for short-period ($\log_{10}P < 3.5$) binaries constructed from the data given by Mazeh et al. (1992) is depicted by open circles. The 1σ error range is indicated by the dotted lines. The distribution of orbits for long periods ($\log_{10}P > 3.5$) is shown by the filled dots and was obtained from the data presented by Duquennoy & Mayor (1991). Both distributions are normalized to unit area. Bottom panel: the short-period ($\log_{10}P < 3$, open circles) and long-period ($\log_{10}P > 3$, solid circles) eccentricity distributions from Duquennoy & Mayor (1991), both normalized to unit area.