Asteroid clusters similar to asteroid pairs

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We study five small, tight and young clusters of asteroids. They are placed around following largest (primary) bodies: (11842) Kap'bos, (14627) Emilkowalski, (16598) 1992 YC2, (21509) Lucascavin and (39991) 1998 HR37. Each cluster has 2-4 secondaries that are tightly clustered around the primary body, with distance in the 5-dimensional space of mean orbital elements mostly within 10 m/s, and always < 23 m/s. Backward orbital integrations indicate that they formed between $\sim 10^5$ and $\sim 10^6$ yr ago. In the P_1-ΔH space, where P_1 is the primary's spin period and $\Delta H \equiv H_{\rm seceq} - H_1$ is difference between the equivalent total secondary absolute magnitude and the primary's absolute magnitude, the clusters lie in the same range as asteroids pairs formed by rotational fission. We find these tight clusters to be similar to asteroid pairs and we suggest they are "extended pairs", having 2-4 escaped secondaries rather than just one secondary as in the case of an asteroid pair. We compare them to six young mini-families (1270) Datura, (2384) Schulhof, (3152) Jones, (6825) Irvine, (10321) Rampo and (20674) 1999 VT1. These mini-families have similar ages, but they have a higher number of members and they show a significantly larger spread in the mean orbital elements ($d_{\rm mean}$ on an order of tens m/s) than the five tight clusters. In the P_1-ΔH space, all but one of the mini-families lie in the same range as asteroid pairs and the tight clusters; the exception is the mini-family of (3152) Jones which appears to be a collisional family. A possibility that the other five mini-families were also formed by rotational fission as we suggest for the tight clusters ("extended asteroid pairs") will be explored.