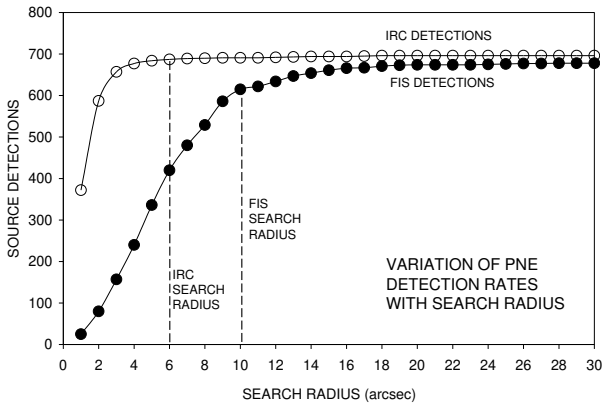

Fig. 1. The variations in the numbers of PNe with size of the search radius θ_S. Note how the numbers of IRC detections achieve a maximum within ∼2 arcsec of the nominal PNe positions, whilst the number of FIS detections increases more slowly, and peaks at radii close to 15–20 arcsec. This difference in detection rates reflects the difference in the positional accuracies of the surveys. Finally, the flattening of detection rates towards larger search radii confirms the low levels of contamination by background sources.

Given that the PNe data base is identical for the FIS and IRC searches, it follows that search radii need to be larger for FIS than for the IRC results.

That this is the case is apparent from Figure 1, where it is seen that the rates of source detection increase with increasing search radius, eventually reaching plateau values of 696 sources for the IRC detections, and 678 sources for the FIS results. It is also apparent that whilst most of the PNe are detected within radii $\theta_S \sim 3$ arcsec for the IRC results, a radius of order $\theta_S \sim 14$ arcsec is required for comparable rates of FIS detection. We have adopted a search radius $\theta_S = 6$ arcsec for the IRC results, and $\theta_S = 10$ arcsec for the FIS photometry.

There are two reasons to suspect that background contamination is extremely modest. It is apparent, for instance, that rates of source detection are flat as θ_S increases from ∼15 arcsec to 30 arcsec, implying that any field source contamination is likely to be $< 2\%$. We also note that the AKARI FIS catalogue includes a parameter NDENS, corresponding to the number of sources within 5 arcmin of the central (PNe) positions. This takes a mean value of ∼2.2 for 415 estimates of the parameter in the most sensitive (90 μm) channel, suggesting again that background contamination is extremely low. A similar conclusion applies for the NDENS parameters at 9 and 18 μm, corresponding to the numbers of sources within 45 arcsec of the search positions. We determine mean values NDENS09 = 0.068 (for 396 estimates of the parameter), and NDENS18 = 0.020 (for 612 estimates of NDENS), implying that very few of our identifications are likely to be spurious.

2.2. *Catalogue Results for Galactic PNe*

Photometric results for 857 PNe detected in the IRC catalogue are presented in Table 1, where all of the fluxes have FQUAL values of 3 (i.e. all of the data are classified as being valid). An analysis by the AKARI team of trends in photometric errors shows that the most probable uncertainties are of the order of ∼2–3%, with 80% of the data having errors of $< 15\%$. It is found that the signal to noise ratio (S/N) for the 9 μm data is of order ∼19 for sources having $F(9\ \mu\mathrm{m}) > 0.5$ Jy, and falls as approximately S/N ∼32 $F_\nu(9\ \mu\mathrm{m}) + 4$ for smaller flux levels. Similarly, it is found that the S/N for 18 μm results is ∼15 where $F(18\ \mu\mathrm{m}) > 0.8$ Jy, and decreases as ∼17 $F_\nu(18\ \mu\mathrm{m}) + 3$ below this limit.

We have, apart from this, specified the numbers of the PNe in the Kerber et al. (2003) list of coordinates (Column 1); the commonly accepted names of the sources (Column 2); and the right ascensions and declinations of the nebulae (Columns 3 and 4). The angular diameter θ is based upon radio and optical results, where we have taken values from Acker et al. (1992), Zhang (1995), Cahn & Kaler (1971), Tylenda et al. (2003), Perek & Kohoutek (1967), and Siodmiak & Tylenda (2001). Where maximal and minimal diameters θ_{MAX} and θ_{MIN} are quoted, then we have employed harmonic mean values $\theta = (\theta_{\mathrm{MAX}}\theta_{\mathrm{MIN}})^{0.5}$. Similarly, the AKARI mean radii at 18 μm (denoted in the catalogue by MEAN_AB18) are provided in Column 8, and labeled MN_18. The 1.4 GHz results (Column 9) are taken from the uniform data base of Condon et al. (1998), whilst the 5 GHz measures (Column 10) derive from the compilations of Acker et al. (1992), Zhang (1995) and Siodmiak & Tylenda (2001). Finally, the distances of PNe remain notoriously uncertain, and the numbers of more reliable distances (i.e. those based on trigonometric, reddening, gravitational and kinematic measures, among others) are still pitifully small. We have therefore quoted distances based on larger-scale statistical measures, whilst recognizing that these are prone to systematic and random errors. Typical uncertainties in distance are probably of the order ≈30%. We have used values quoted by Phillips (2004) and Zhang (1995) in that order of priority, and these are listed in Column 11 of Table 1. These estimates are also combined with the angular diameters in Column 7 to determine the physical diameters in Column 12.