statistical analysis using the new data provided by Cavichia et al. (2010, hereafter Paper I), and additional data from the literature, in order to characterize the interface between the bulge and inner-disk of the Galaxy, as defined by the PNe population. Taking into account both the abundance distributions and the individual distances for a sample of PNe, we are able to characterize the interface by establishing at which galactocentric distance bulge and disk characteristics better separate.

This paper is organized as follows: in § 2 the details of the sample and the new distances to our objects are presented. In § 3 the method used in order to characterize the bulge-disk transition is described. In § 4 we discuss the results and compare them with other results in the literature. Finally, in § 5 the main conclusions are presented.

2. THE SAMPLE AND NEW DISTANCES

2.1. *The Sample*

An extensive number of statistical scales have been proposed in the literature, and two of them have been adopted in order to study the chemical abundance distribution in the inner Galaxy: the Stanghellini et al. (2008, hereafter SSV08), and the Zhang (1995, hereafter Z95), distance scales. These scales are based on the Shklovsky method but with the introduction of a relationship between the ionized mass and the radius of the nebula, as proposed by Maciel & Pottasch (1980). SSV08 is a recent revision of the Cahn et al. (1992, hereafter CKS92), scale based on the physical properties of the PNe in the Magellanic Clouds, whose distances are accurately known. As the authors argue, this new distance scale is the most reliable to date.

The selection criteria applied to search for objects in the two catalogues (SSV08 and Z95) were the following: we selected those PNe which had 5 GHz fluxes lower than 100 mJy, optical diameters smaller than 12 arcsec, and galactic coordinates within the range $|\ell| \leq 10^\circ$ and $|b| \leq 10^\circ$. The galactic coordinates were used to take into account only the PNe which are in the galactic center direction. The combination of the other two criteria leads to the rejection of about 90–95% of the PNe which are in the galactic center direction, but have heliocentric distances of less than 4 kpc (cf. Stasińska, Richer, & McCall 1998). These criteria are commonly used by other authors to select bulge PNe (e.g., Exter et al. 2004 and Chiappini et al. 2009), so that most of the objects considered in this work should be at or near the bulge.

In order to study the chemical abundance distribution in the inner Galaxy, we have made use of the data published by our group (Cavichia et al. 2010; Escudero et al. 2004; Escudero & Costa 2001). We also searched for chemical abundances of PNe located in the bulge and inner-disk of the Galaxy in the following works: Ratag et al. (1997), Exter et al. (2004), Górny et al. (2004), Perinotto, Morbidelli, & Scatarzi (2004), de Freitas Pacheco, Maciel, & Costa (1992), Köppen, Acker, & Stenholm (1991), Samland et al. (1992), Cuisinier et al. (2000). All these works deal with the same region of interest, and, besides that, they contain significant and homogeneous samples, which is very important in multi-object study, as we propose in this work. For more details on these works see Paper I. Adding these objects to our original sample in Paper I, our database contains 140 objects, as given in Table 1. In this table, the columns give the PN G number, the name of the nebula, the galactocentric distance in kpc for the SSV08 and the Z95 distance scales, respectively. An asterisk marks those PNe whose distances were derived in the present work. The galactocentric distances of the objects located beyond the galactic bulge are given with a negative sign in Table 1. The extinction in this region is very high, and the uncertainties in the distances are large, reaching 30% in some cases. For example, an object with a heliocentric distance of 8 kpc in this direction according to both scales will have a true heliocentric distance between 5.6 and 10.4. Therefore, it is unlikely that these objects are really located far beyond the galactic bulge, so that we assume that they actually belong to the bulge population. The implications of this assumption will be further discussed in § 3.3. More details on the new distances and the determination of the galactocentric distances are given in § 2.2.

2.2. *New distances to the Planetary Nebulae*

Several of the objects for which the chemical abundances were determined in Paper I, do not have distances published by SSV08. In order to include these PNe in our analysis, their distances were estimated from equations (8a) and (8b) of SSV08. In cases where the 5 GHz flux was not available, their equivalent 5 GHz flux from Hβ flux was derived using equation (6) in CKS92. The optical thickness parameter was derived from equation (2) in SSV08. Angular radii were obtained from the literature, most of them from Acker et al. (1992), and some from more recent works such as Tylenda et al. (2003) and Ruffle et al. (2004). The objects with new distances are marked with an asterisk in Table 1, and the data