7. Profiles and trend assessment of selected determinands

To present the variation of water quality along the river and in the main tributaries, the average, maximum and minimum concentration profiles along the Danube of determinands dissolved oxygen, BOD_5 , COD_{Cr}, NH_4^+-N, NO_3^--N, PO_4^{3-}-P, total phosphorus, chlorophyll-a, cadmium, mercury, p,p´DDT and atrazine are presented on special profile plots, one profile for each of the determinands (Figures 7.1 – 7.12). In order to illustrate the temporal changes of water quality in TNMN monitoring stations during the period of TNMN operation from 1996-2001, Figures 7.13 – 7.28 show 90 percentiles (10 percentile in case of dissolved oxygen) of yearly data sets for selected determinands. The 90 percentile as a statistical characteristic used for this assessment is presented only for those monitoring stations where frequency of measurements was higher than 5 in the respective year. If there are three sampling sites (left, middle, right) of a monitoring station, only the data of the "middle" is presented in the Figures. Each of Figures 7.1 – 7.12 consists of two plots. The upper plot shows bars indicating the average, maximum and minimum concentrations in the Danube River at the respective distance from the mouth (km). Green indicates the minimum values on the plots and red the maximum values. Stations close to each other or those monitored by two countries (transboundary stations) are shifted slightly along the X-axis.

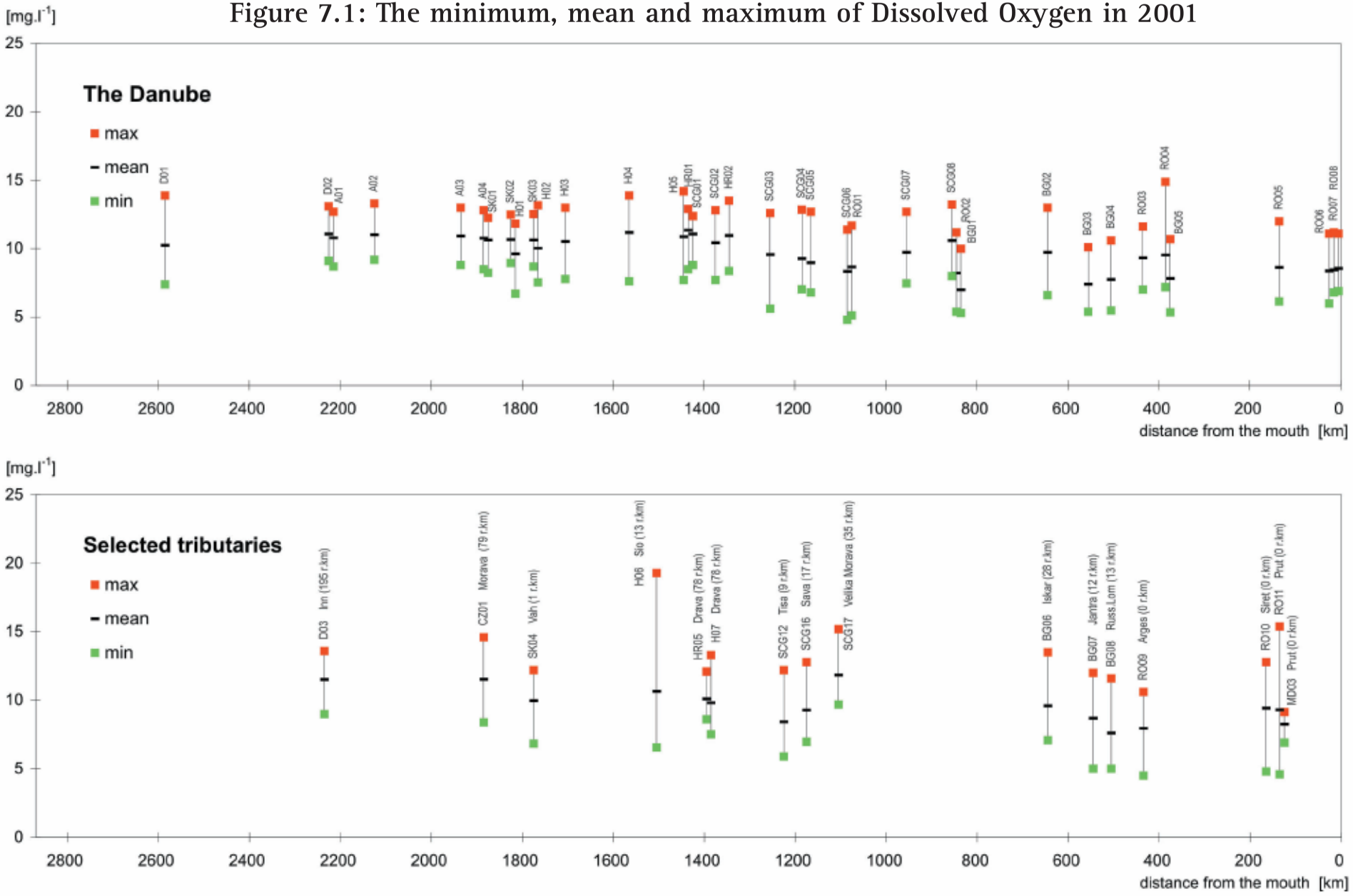
Using the same method, the lower plot shows the concentration ranges at the most downstream stations on the primary tributaries. In these graphs the bars are plotted at the river-km of the confluence of the tributary with the Danube.

Observations from assessment of the five-year period, presented in the Synthesis Report, were confirmed by the figures – the highest pollution by biodegradable organic matter in the middle part of the Danube, increasing of content of ammonium-N, ortho-phospate-P, and total P from upper to lower part of the Danube River (with some exceptions of extreme values), and significant increase of cadmium content in the lower part of the Danube River. Level of nitrate-N is relatively stable, but after delivery of the data from Yugoslavia the intermediate decrease in this section of the Danube River was observed. Regarding organic pollution and nutrient content, the majority of tributaries are more polluted than the Danube River itself at the location of their confluence, concentrations show higher variation, and situations with extreme values are observed.

Positive changes in water quality are observable in several stations of TNMN. Decrease in biodegradable organic pollution can be seen in the Austrian and Slovakian section of the Danube River, further at Danube-Hercegszanto, and in the lower section of the River downstream of Danube-Chiciu/Silistra. Tributaries Inn, Dyje, Drava, Arges and Siret show the same tendency.

As for nutrients, ammonium-N decreases in the upper part down to Danube-Szob and in tributaries of the upper section down to river Vah. Nitrate-N decreases in several stations of the German-Austrian section of the river basin, at Danube-Szob, but also in tributaries Morava, Dyje, Vah, Drava and at Sava–us. Una Jasenovac. Regarding ortho-phosphate-P, decreasing tendency is observed in the shared Slovak-Hungarian section of the Danube River, in tributaries of the upper part of the river, further in Drava, Siret and from stations located on Sava River at Sava–us. Una Jasenovac.

Figure 7.1: The minimum, mean and maximum of Dissolved Oxygen in 2001



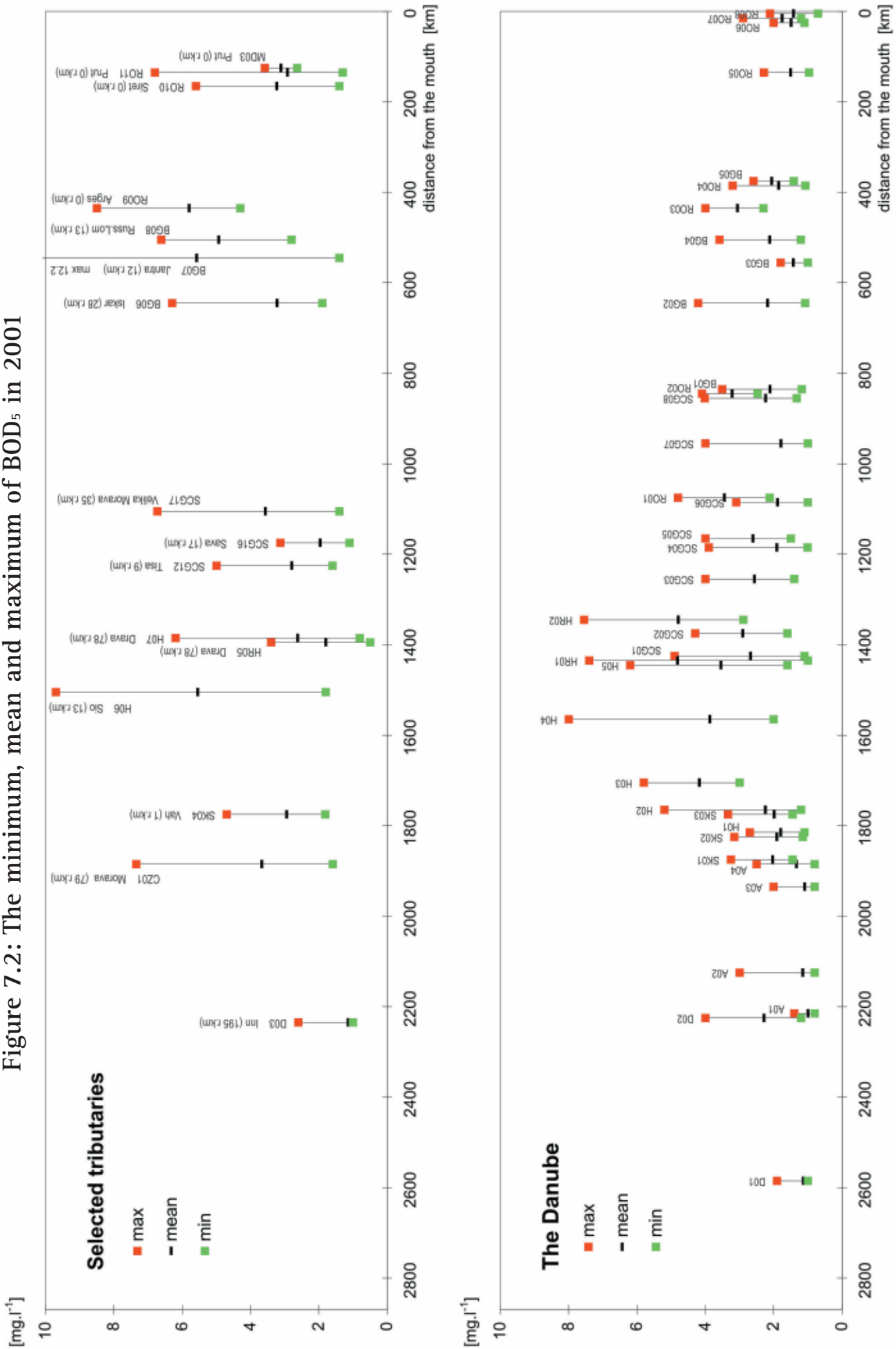


Figure 7.2: The minimum, mean and maximum of BOD_5 in 2001

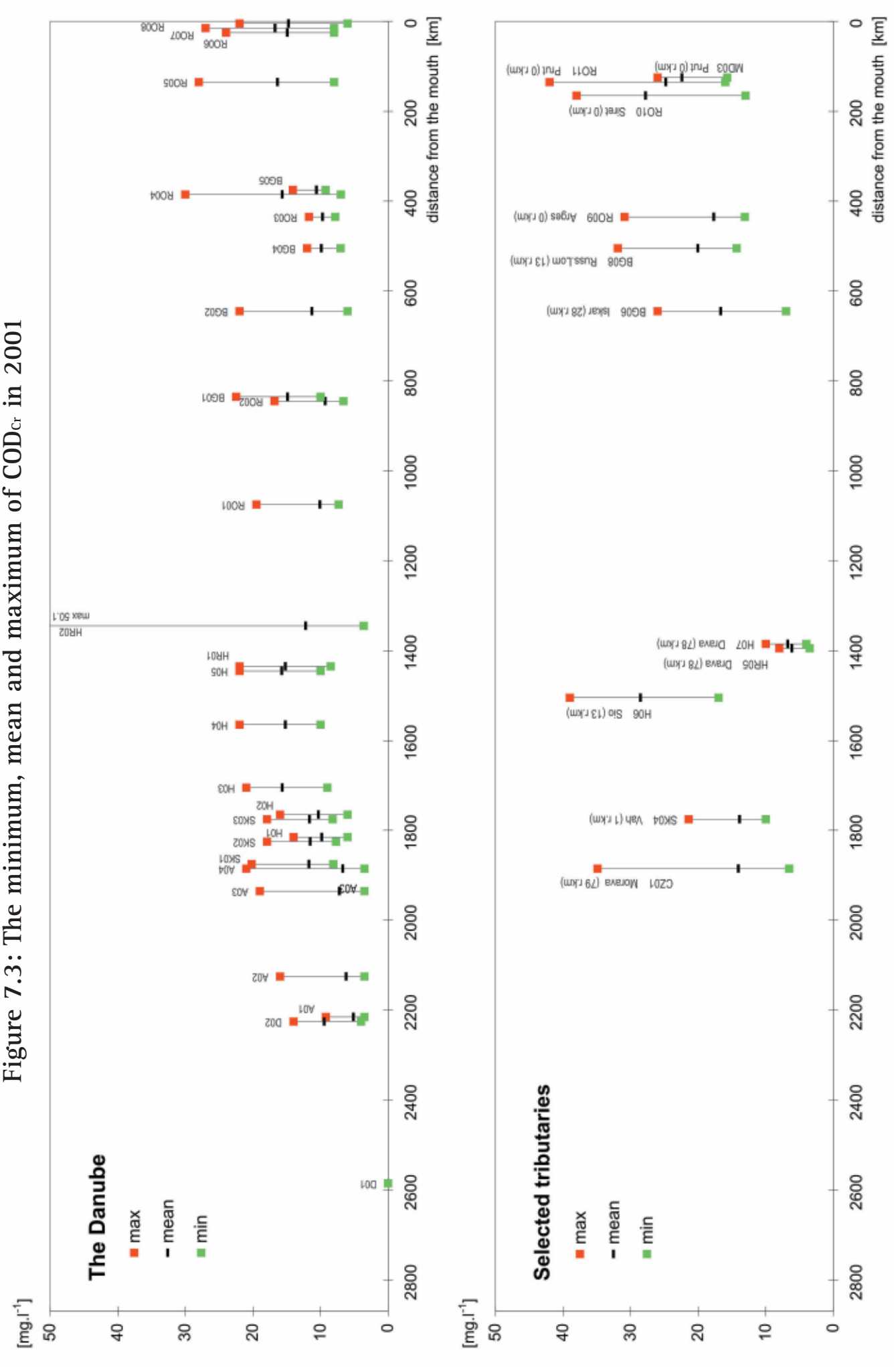


Figure 7.3: The minimum, mean and maximum of COD_{Cr} in 2001

Figure 7.4: The minimum, mean and maximum of NH_4-N in 2001

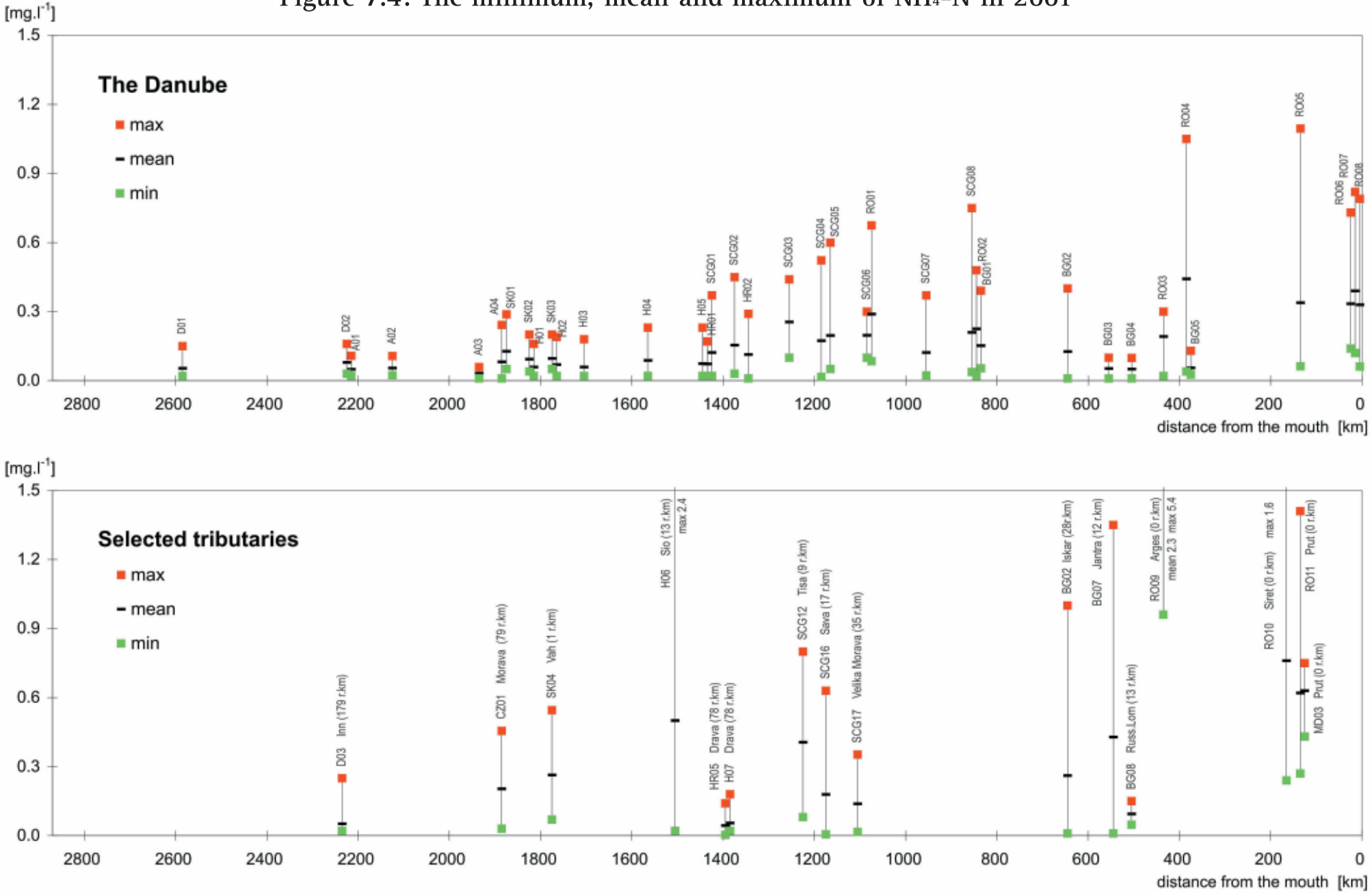


Figure 7.5: The minimum, mean and maximum of NO_3-N in 2001

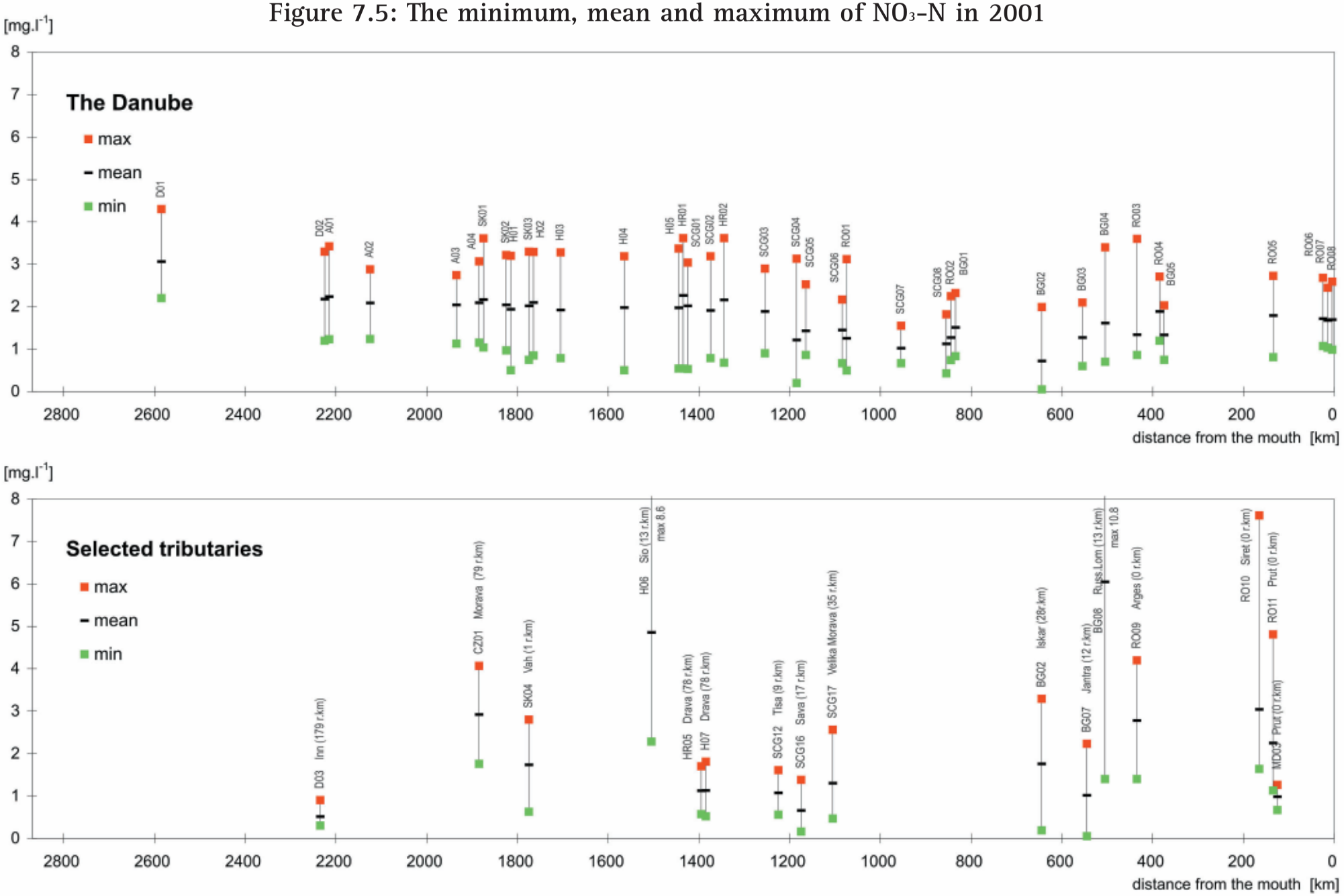
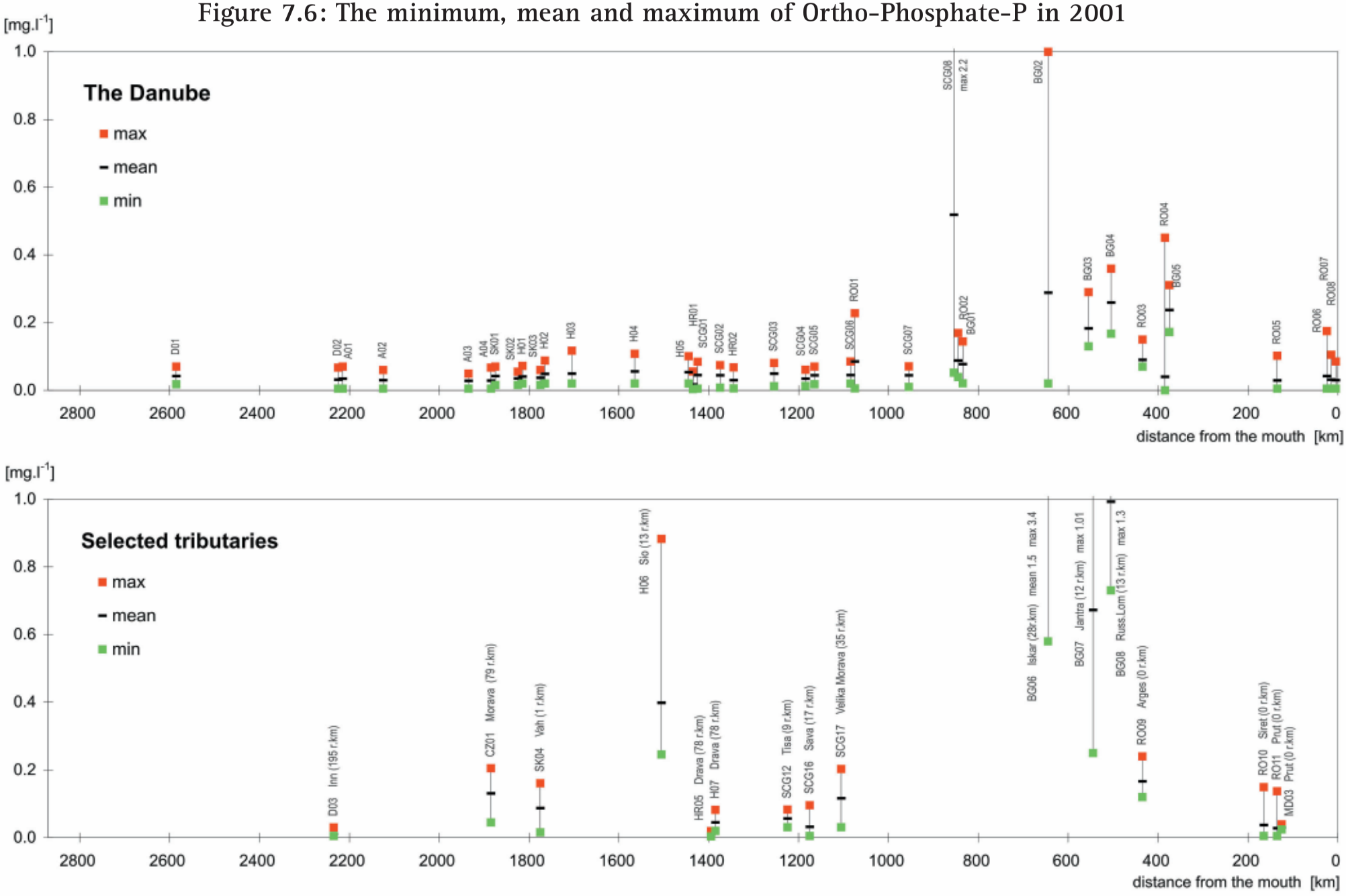


Figure 7.6: The minimum, mean and maximum of Ortho-Phosphate-P in 2001



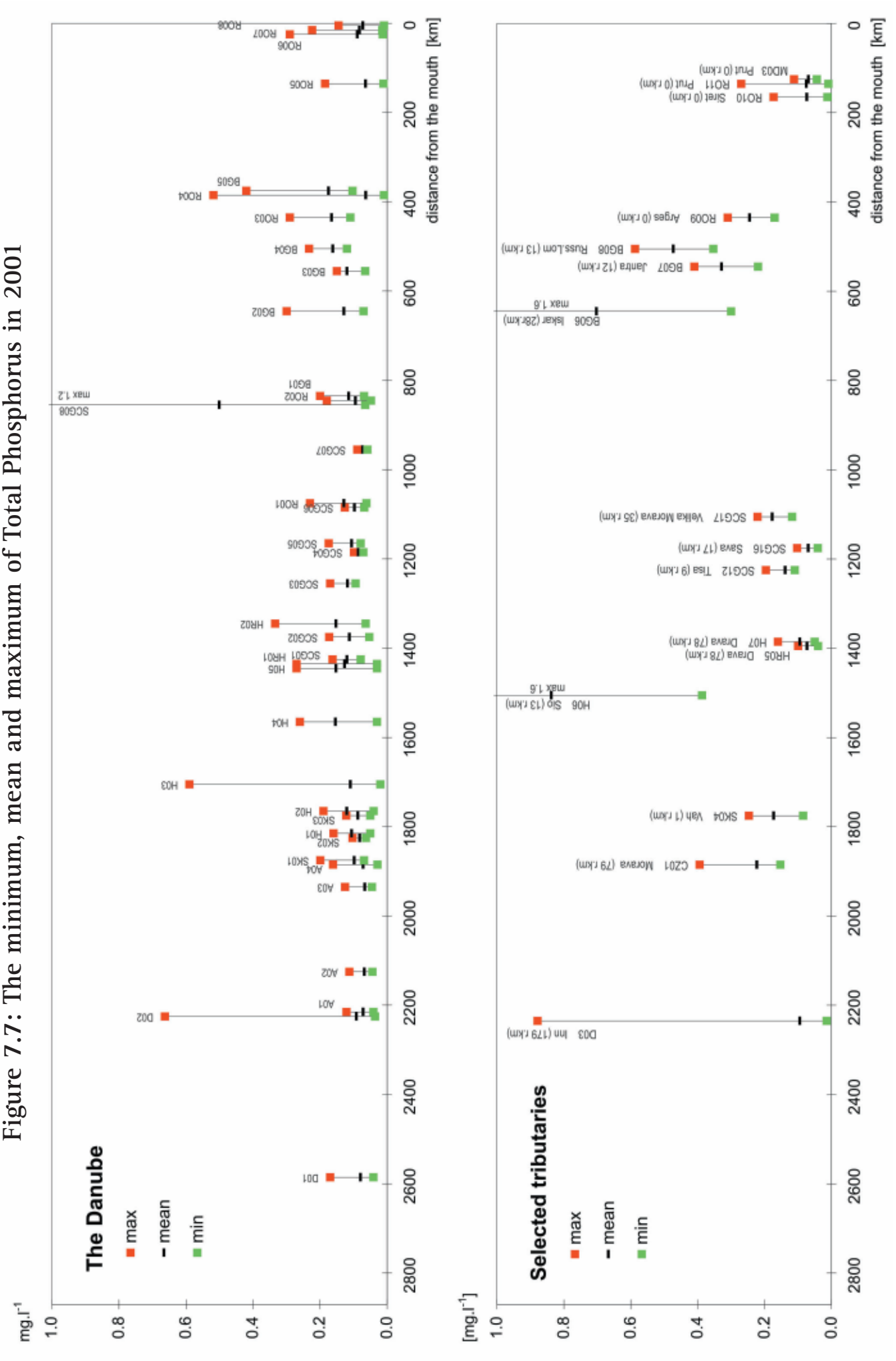


Figure 7.7: The minimum, mean and maximum of Total Phosphorus in 2001

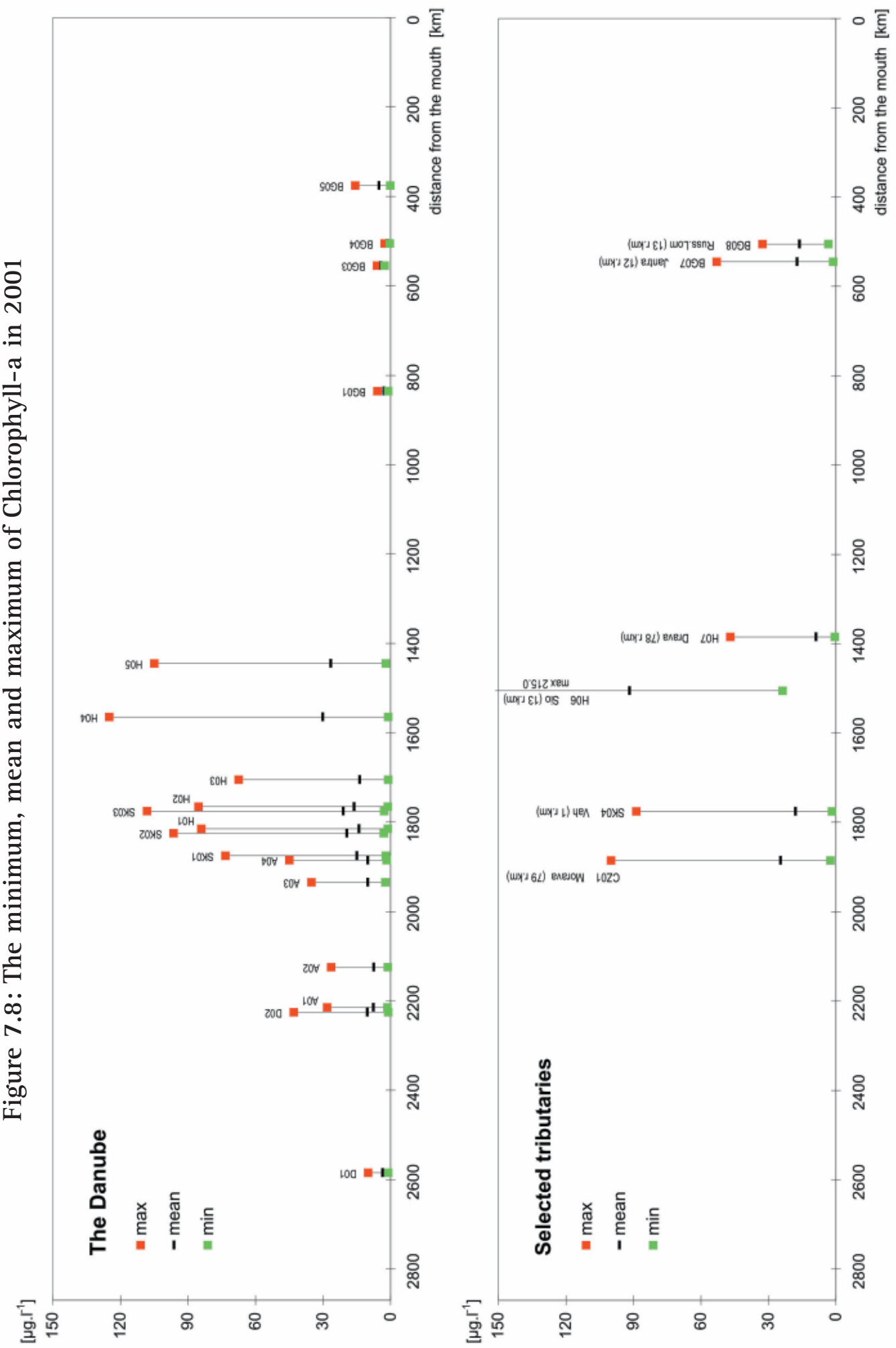


Figure 7.8: The minimum, mean and maximum of Chlorophyll-a in 2001

Figure 7.9: The minimum, mean and maximum of Cd in 2001

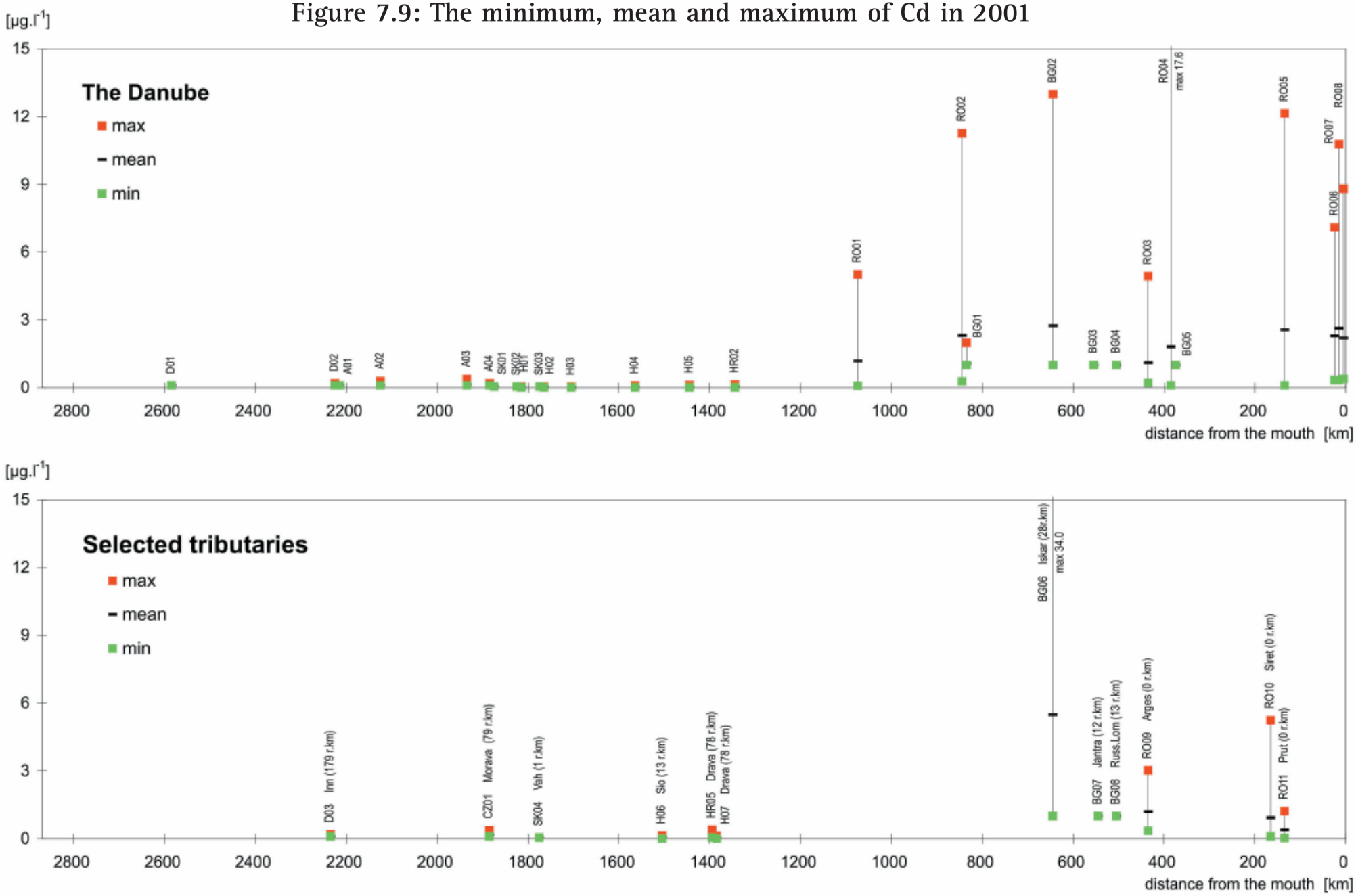


Figure 7.10: The minimum, mean and maximum of Hg in 2001

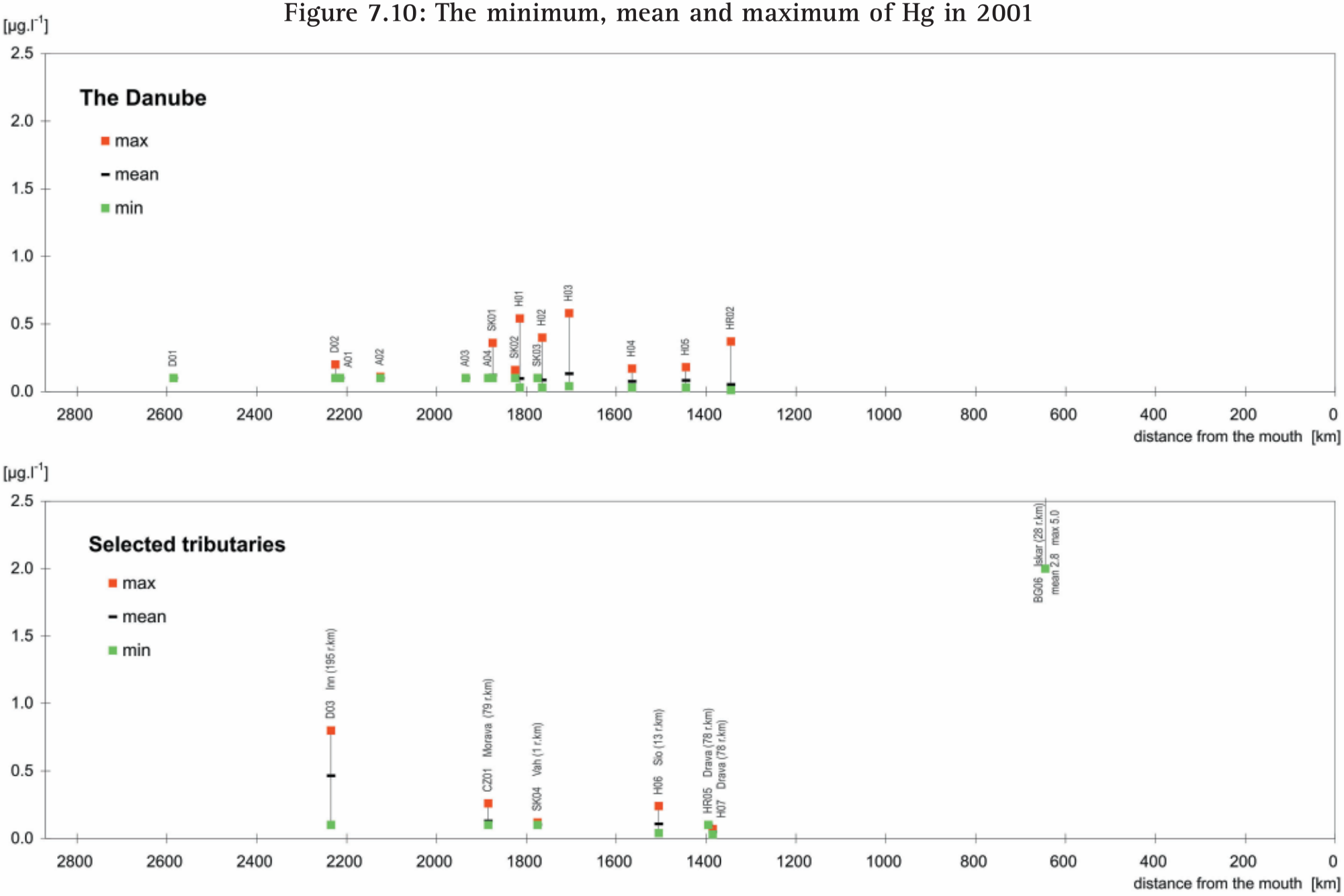
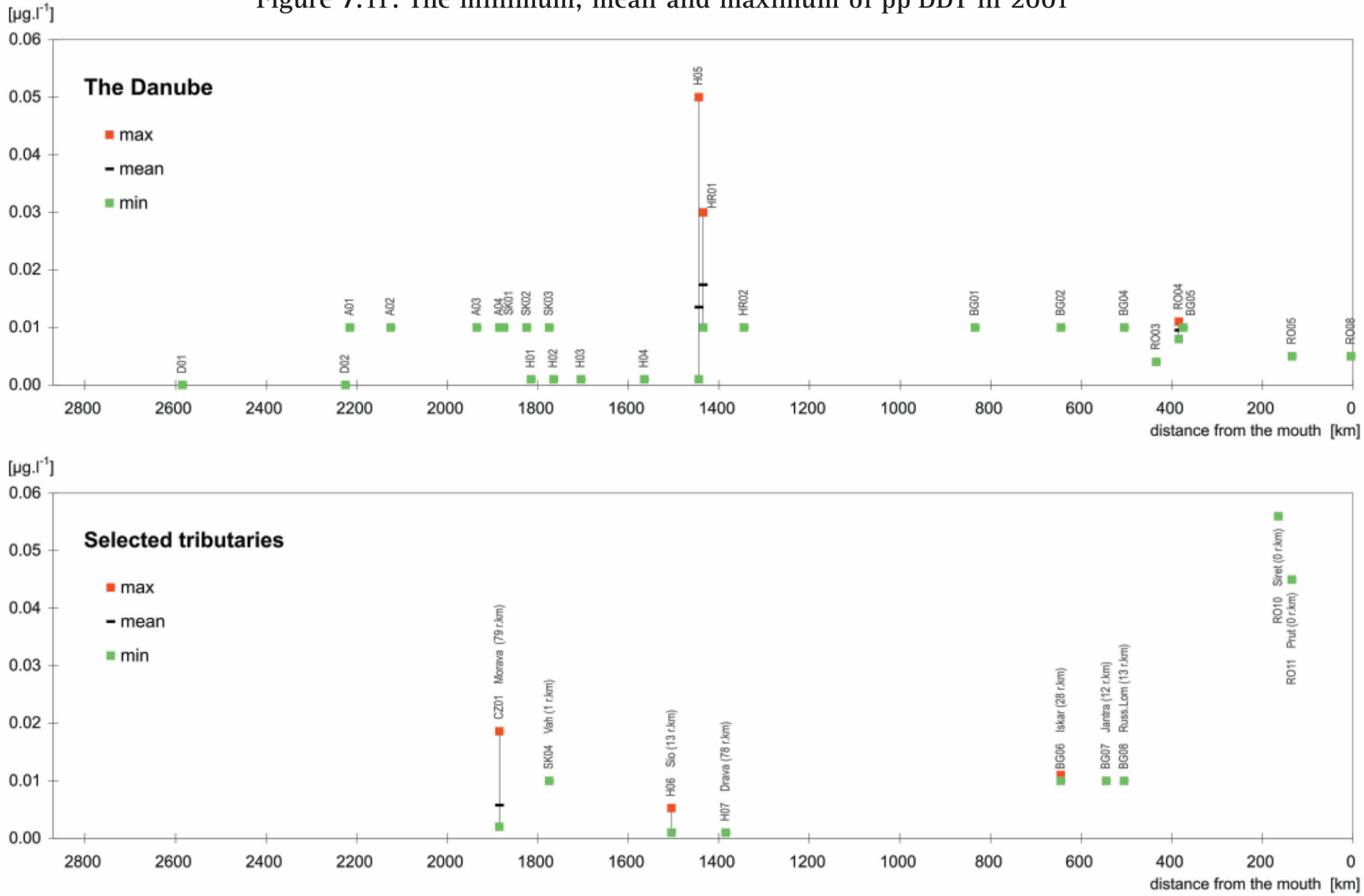


Figure 7.11: The minimum, mean and maximum of pp'DDT in 2001



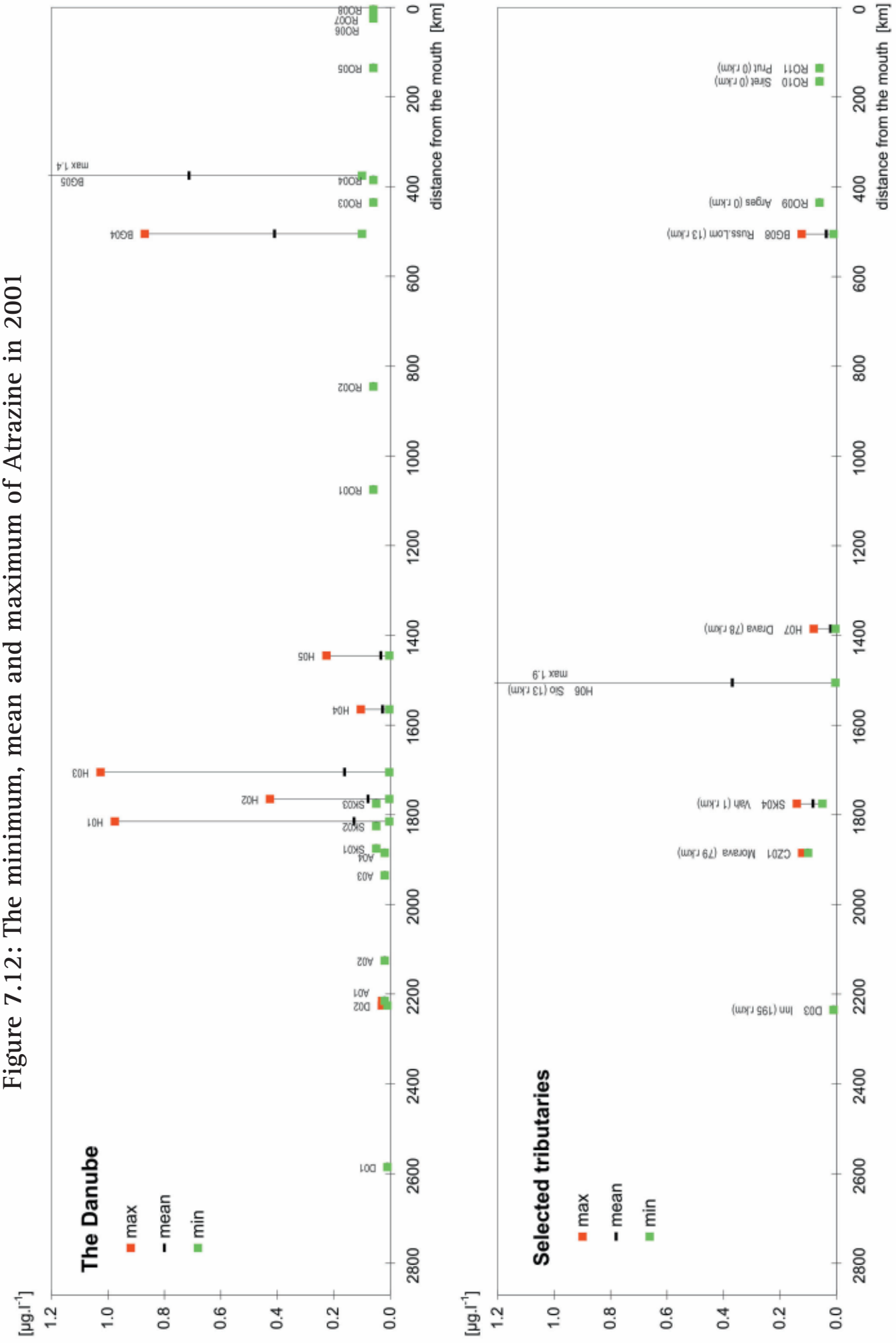


Figure 7.12: The minimum, mean and maximum of Atrazine in 2001

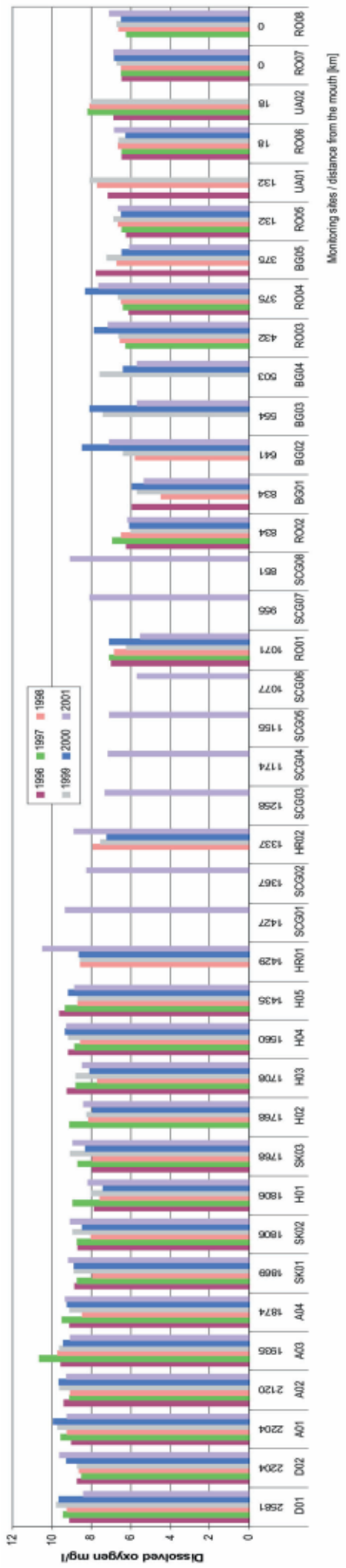


Figure 7.13: Temporal trends of dissolved oxygen in Danube River

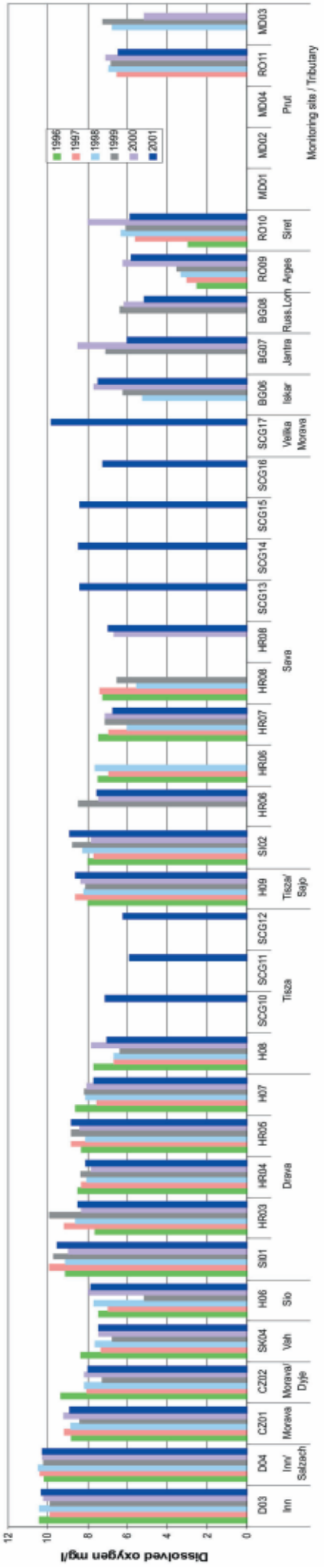


Figure 7.14: Temporal trends of dissolved oxygen in tributaries

Figure 7.15: Temporal trends of BOD5 in Danube River

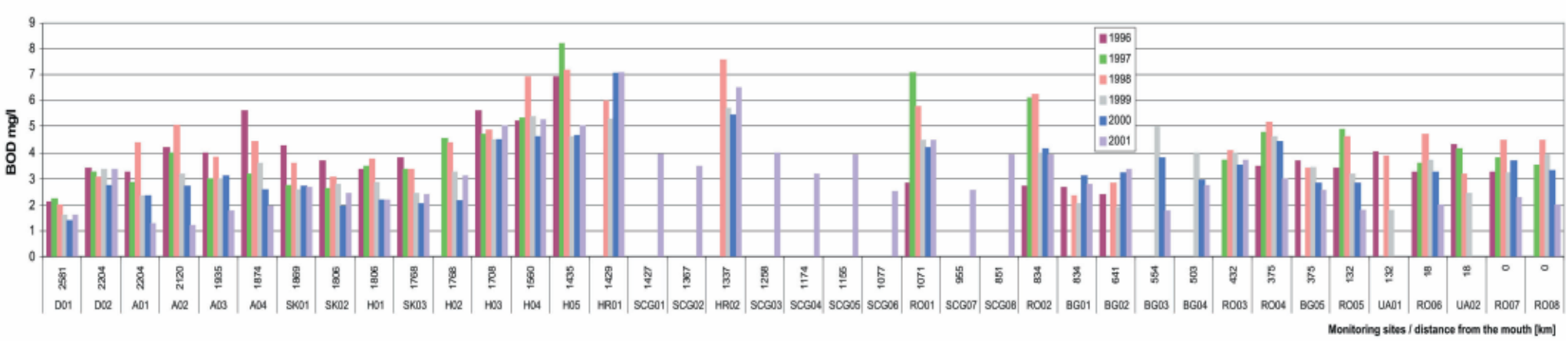


Figure 7.16: Temporal trends of BOD5 in tributaries

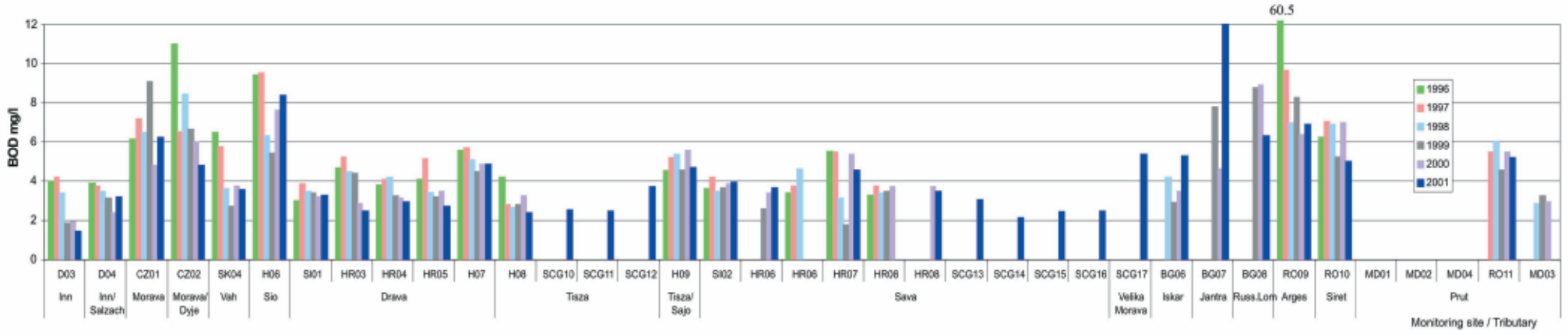


Figure 7.17: Temporal trends of CODCr in Danube River

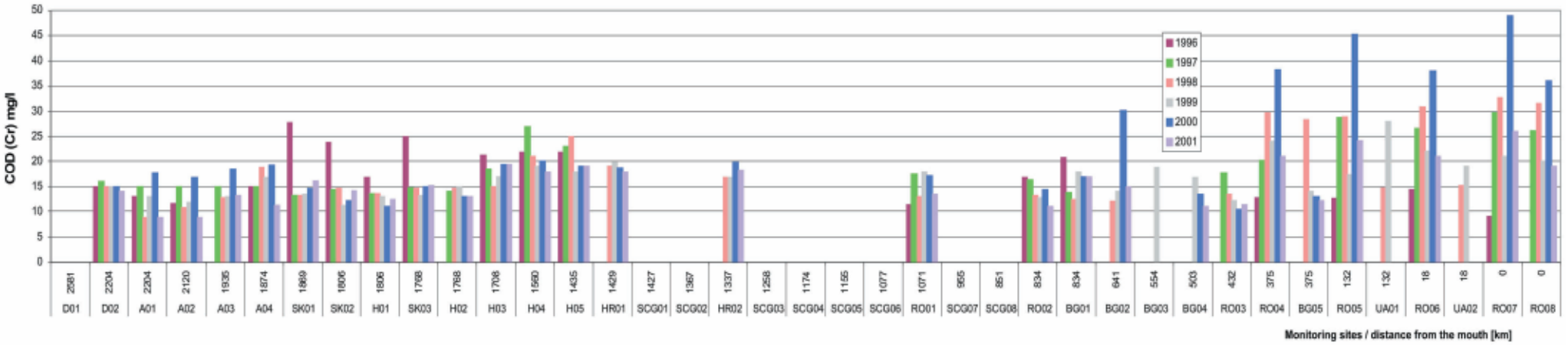


Figure 7.18: Temporal trends of CODCr in tributaries

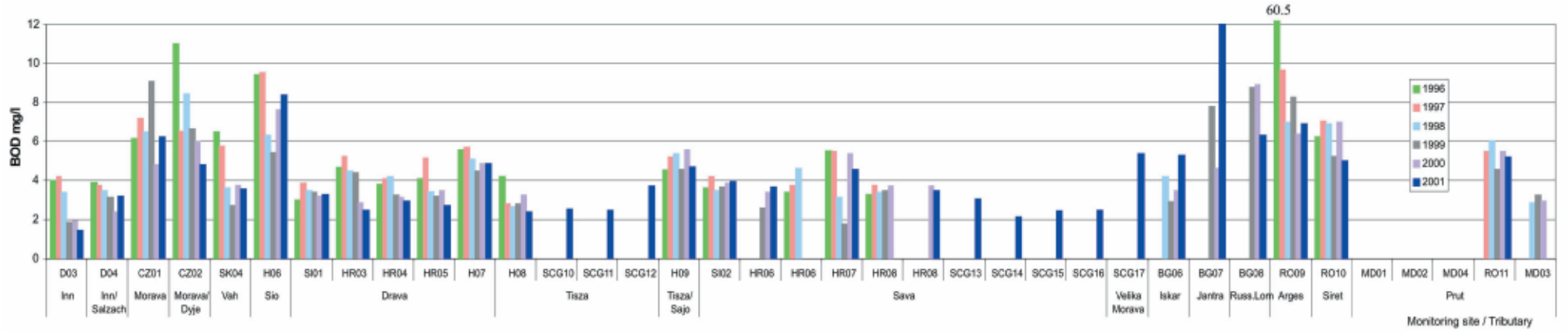


Figure 7.19: Temporal trends of ammonium-nitrogen in Danube River

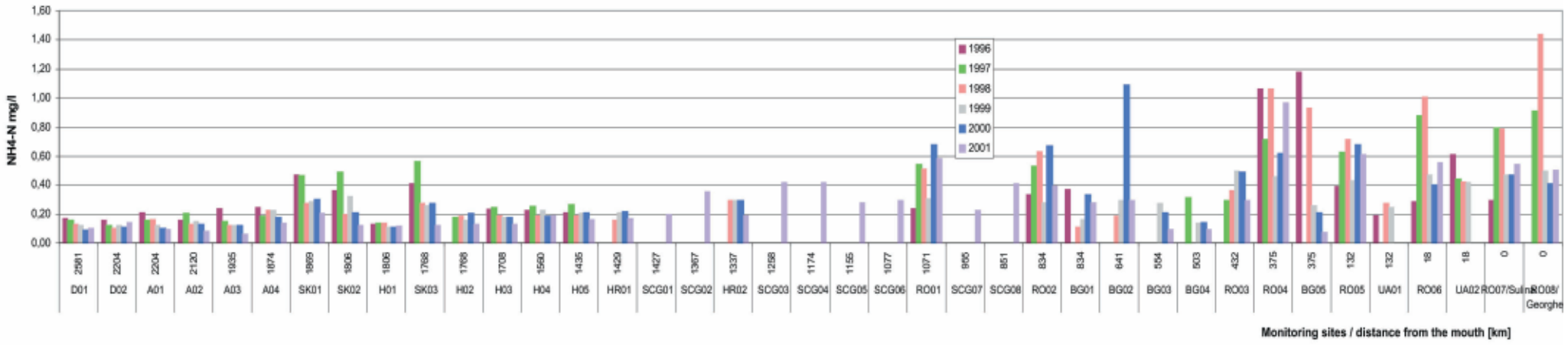


Figure 7.20: Temporal trends of ammonium-nitrogen in tributaries

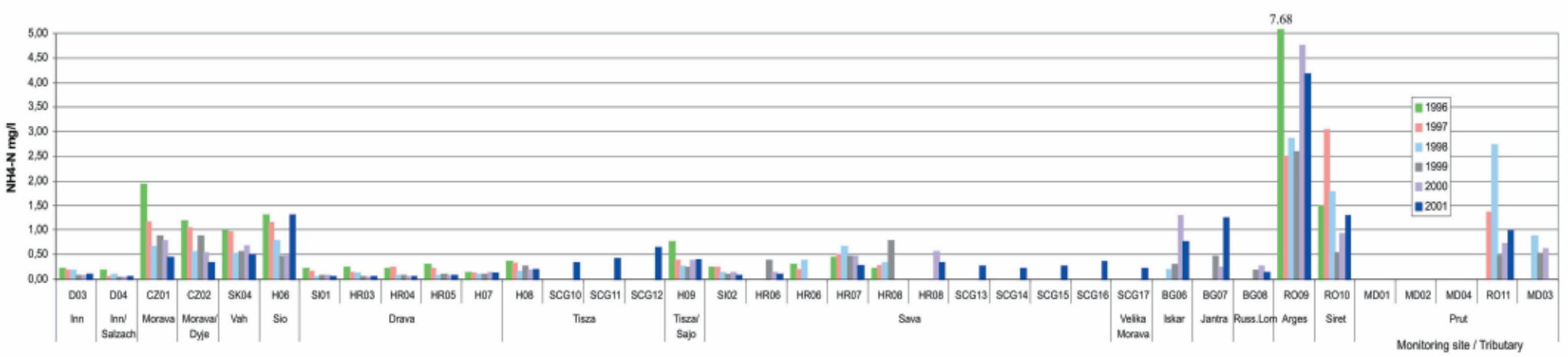


Figure 7.21: Temporal trends of nitrate-nitrogen in Danube River

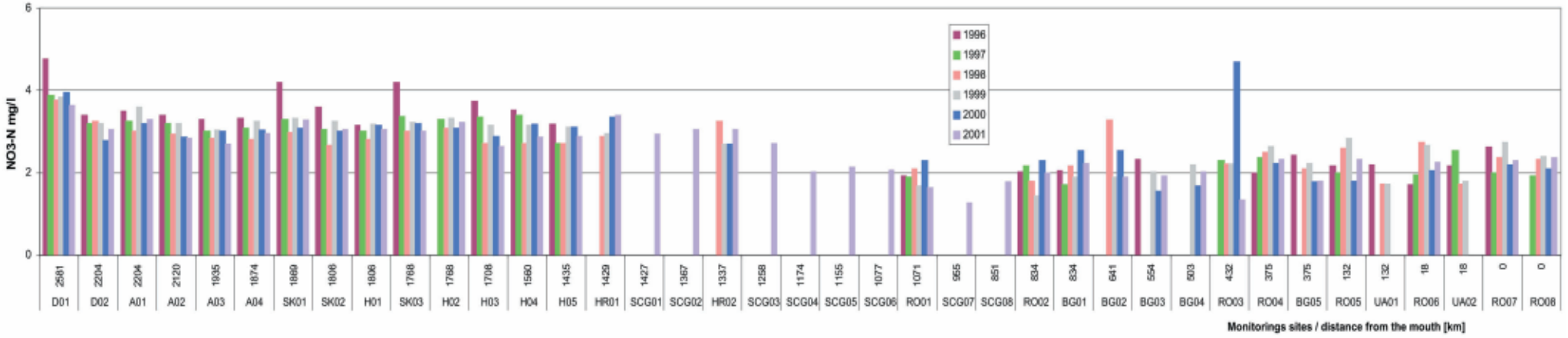


Figure 7.22: Temporal trends of nitrate-nitrogen in tributaries

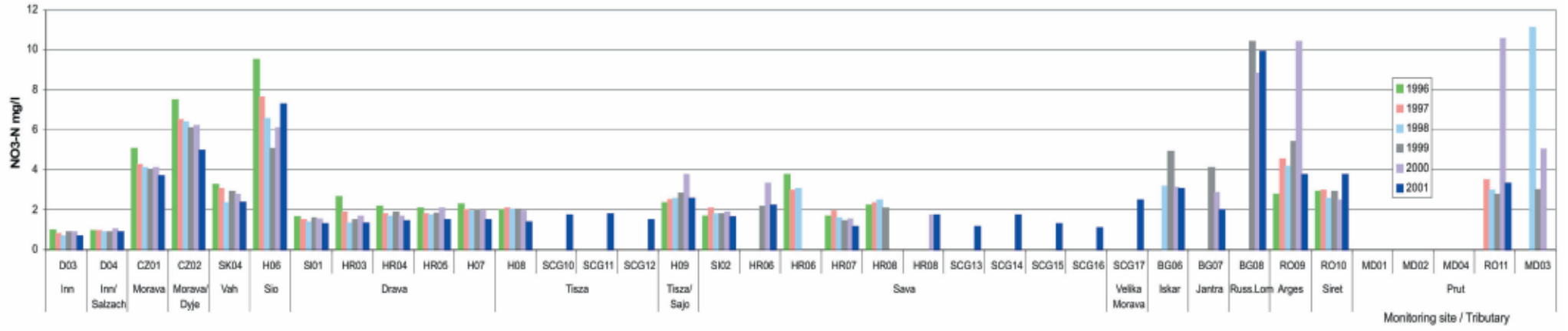


Figure 7.23: Temporal trends of ortho-phosphate-phosphorus in Danube River

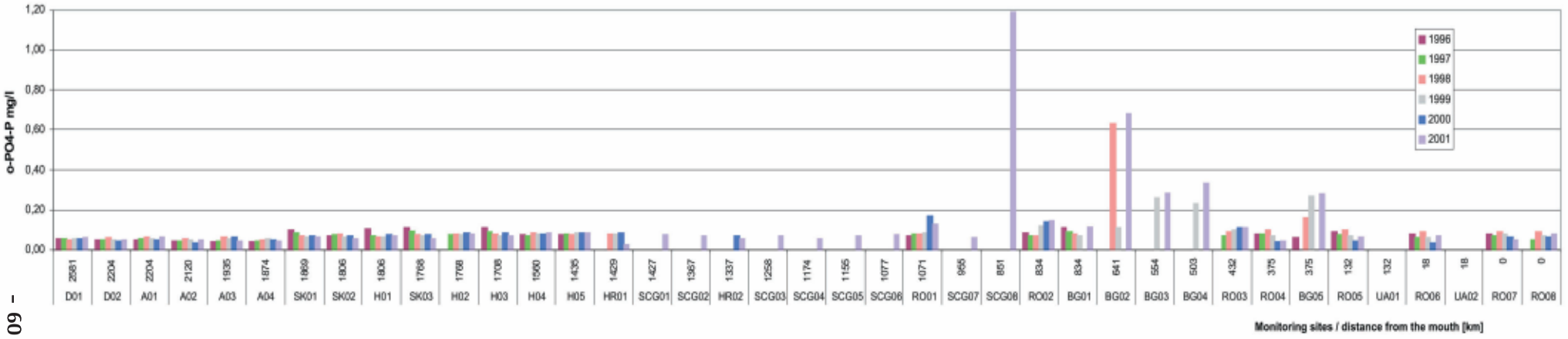


Figure 7.24: Temporal trends of ortho-phosphate-phosphorus in tributaries

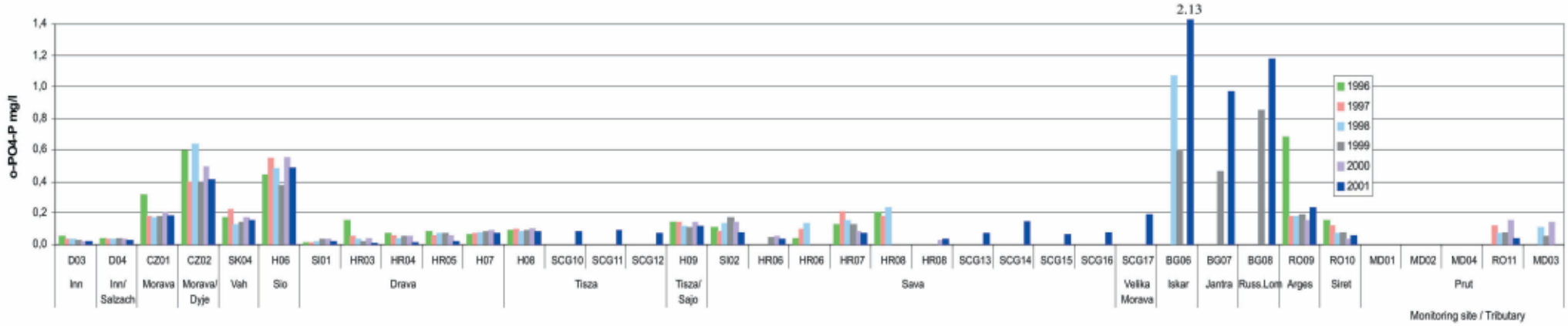


Figure 7.25: Temporal trends of total phosphorus in Danube River

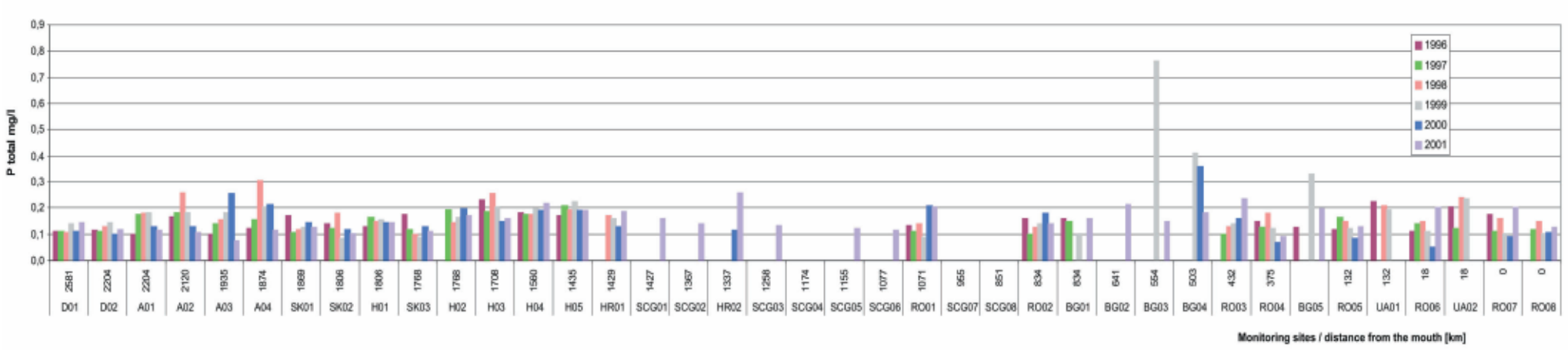


Figure 7.26: Temporal trends of total phosphorus in tributaries

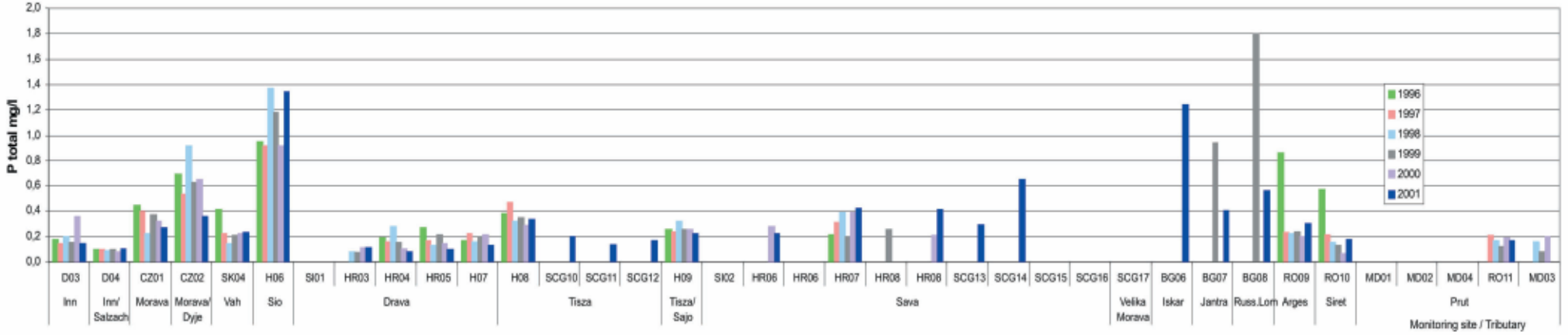


Figure 7.27: Temporal trends of cadmium in Danube River

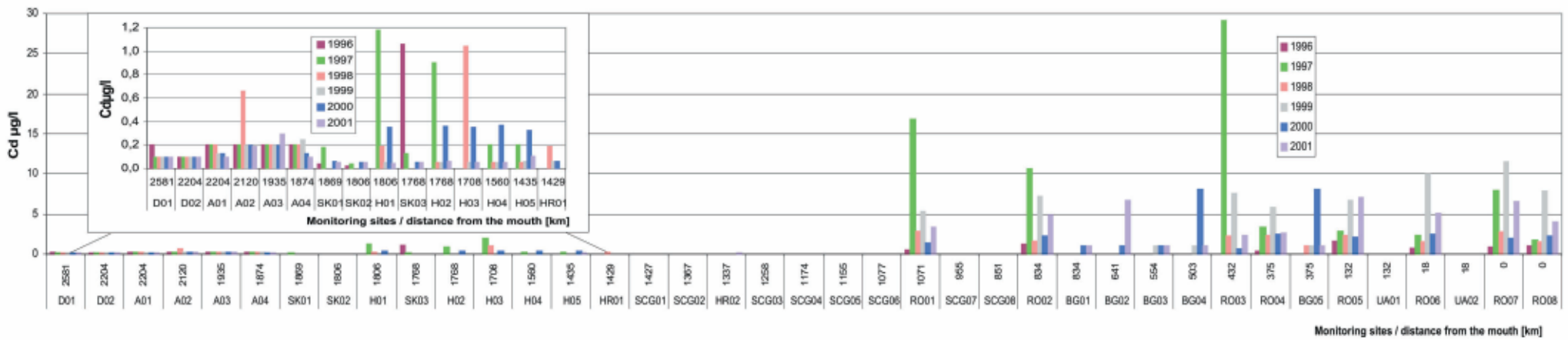


Figure 7.28: Temporal trends of cadmium in tributaries