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THE ROLE OF VARIOUS FRACTIONS OF HUMIC SUBSTANCES FROM SURFACE WATER IN BINDING Al(III), Fe(III), AND Cu(II) INTO COMPLEXES

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Table S1

The metal concentration in the composition of the anionic fraction of DOM and their content in the HS fractions with different molecular weight.

Water bodies	*Metals*	*Metal content in the composition of the anionic fraction of DOM, µg/L*	*Metal content (µg/mg HS) in HS fractions with different molecular weight (kDa)*			
			≥20	*20–5*	*5–1*	*<1*
Kaniv Reservoir (2012–2013), n=13	Al	7.8–59.3 21.1	0.1–4.4 1.1	0.1–0.7 0.3	0.1–1.3 0.6	0.5–8.6 2.3
	Fe	5.9–603.0 151.9	0.0–12.2 4.0	0.1–2.1 0.6	0.1–5.1 1.3	0.0–30.2 4.1
	Cu	6.3–27.6 13.6	0.0–12.1 2.5	0.1–1.1 0.4	0.0–1.9 0.6	0.2–18.0 4.3
Desenka arm (2011), n=2	Al	3.1–4.0 3.6	0.2–0.7 0.5	0.1–0.3 0.2	0.2–0.4 0.3	0.2–0.4 0.3
	Fe	11.7–27.5 19.6	0.8–1.5 1.2	0.2–0.3 0.3	1.0–1.2 1.1	2.4–3.7 3.1
	Cu	27.8	0.9	1.8	2.9	1.0
Yurpil Reservoir (2012–2013), n=8	Al	4.9–25.9 18.7	0.1–6.1 1.6	0.1–0.7 0.3	0.1–1.2 0.4	0.3–8.7 3.0
	Fe	14.2–136.0 64.1	1.8–30.6 7.4	0.2–3.7 1.1	0.2–9.7 2.4	0.6–10.2 4.5
	Cu	4.9–29.4 16.5	0.1–20.0 5.8	0.2–2.0 1.0	0.2–2.5 1.0	0.1–15.0 4.5
Middle Bila Tserkva Reservoir (2011), n=6	Al	11.8–29.3 19.6	0.4–3.6 2.2	0.6–1.2 0.9	0.8–2.1 1.5	0.6–4.4 2.3
	Fe	7.7–67.5 27.2	0.0–21.2 6.6	0.3–2.0 0.9	0.7–4.4 2.2	1.7–17.8 4.5
	Cu	2.7–14.3 8.5	0.0–7.5 2.2	0.6–2.2 1.3	0.5–3.1 1.5	0.6–2.0 1.3
Ternopil Reservoir (2011), n=6	Al	4.2–19.7 10.6	0.0–14.4 5.5	0.5–1.6 1.1	0.5–5.4 1.9	0.4–3.6 1.5
	Fe	5.4–77.3 32.4	0.0–37.9 12.4	0.2–6.0 2.1	0.4–23.2 6.3	1.1–19.7 5.1
	Cu	6.0–18.4 11.7	0.5–5.0 3.1	1.3–3.9 2.4	0.6–5.8 2.9	1.1–4.1 2.3
Tsyr River (2012–2013), n=3	Al	5.5–40.0 17.2	0.1–0.6 0.3	0.0–0.2 0.1	0.1–0.2 0.2	0.1–1.9 0.8
	Fe	43.6–342.7 166.0	0.9–6.5 3.6	0.3–2.4 1.0	1.2–2.5 1.9	4.9–17.1 10.1
	Cu	5.9–24.9 17.7	0.1–1.1 0.5	0.0–0.5 0.3	0.1–0.8 0.3	0.1–3.8 1.5
Prypyat River (2012), n=1	Al	24.4	0.5	0.1	0.1	0.2
	Fe	309.0	6.9	2.0	3.3	12.5

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Continuation of Table 1

Water bodies	*Metals*	*Metal content in the composition of the anionic fraction of DOM, μg/L*	*Metal content (μg/mg HS) in HS fractions with different molecular weight (kDa)*			
			≥20	*20–5*	*5–1*	*<1*
Desna River (2011–2012), n=9	Al	5.4–67.0 26.5	0.4–14.1 4.8	0.1–1.1 0.4	0.3–3.5 1.1	0.3–4.3 1.8
	Fe	14.9–111.5 58.8	2.8–14.3 6.5	0.2–2.6 1.1	0.3–8.7 2.7	0.0–38.2 10.9
	Cu	7.2–16.9 11.3	0.3–3.4 1.9	0.4–2.1 0.8	0.3–1.6 1.0	0.6–5.4 2.4
Pivdennyy Bug River (2011), n=5	Al	4.2–122.5 34.6	0.3–2.6 1.6	0.1–1.9 0.9	0.2–7.6 3.2	0.2–2.2 1.2
	Fe	7.1–109.5 48.2	0.6–11.9 6.3	0.2–4.0 1.2	0.1–7.6 2.0	0.5–2.8 1.8
	Cu	5.5–22.3 13.1	1.4–4.4 3.0	0.5–2.4 1.4	0.8–4.1 2.2	0.6–2.5 1.5
Seret River (2011), n=5	Al	4.9–46.3 16.0	0.0–13.7 3.6	0.1–5.4 1.6	0.2–5.5 1.4	0.5–6.2 2.5
	Fe	6.3–248.0 75.7	0.0–34.3 19.0	0.4–12.1 4.3	0.0–19.9 5.1	1.4–52.3 20.1
	Cu	4.9–16.6 10.5	0.0–6.7 2.9	0.3–3.6 1.8	1.4–4.9 3.0	2.4–12.5 6.3
Kiliya Danube Delta (Skhidnyy arm, 2012), n=1	Al	27.2	2.3	2.4	3.4	5.6
	Fe	38.7	5.4	4.7	2.2	10.4
	Cu	4.4	1.4	0.3	0.9	2.5
Lutsymer Lake (2011), n=7	Al	1.8–42.1 22.8	0.9–1.2 1.1	0.1–2.3 0.8	0.1–1.4 0.7	0.3–5.1 2.2
	Fe	55.3–222.0 102.2	1.0–4.3 2.7	0.3–2.0 1.2	1.2–5.2 2.7	1.4–5.4 3.2
	Cu	9.5–24.4 15.1	0.6–1.0 0.8	0.2–1.5 0.8	0.3–2.0 0.9	0.3–2.7 1.2
Chorne Velyke Lake (2011), n=5	Al	4.0–40.9 24.3	0.8–23.6 10.4	0.1–1.3 0.8	0.5–12.8 3.6	0.3–20.0 5.0
	Fe	10.8–92.3 41.6	0.0–25.3 15.1	0.2–1.6 0.8	0.2–11.2 5.1	0.4–11.9 5.4
	Cu	9.8–16.3 13.8	0.0–3.8 2.0	0.5–1.5 0.8	1.1–9.7 3.3	1.1–7.9 2.9
Yordans'ke Lake (2012), n=1	Al	28.2	3.7	0.9	1.7	1.9
	Fe	11.6	7.1	0.3	0.5	0.03
	Cu	9.2	1.3	1.3	0.7	1.7
Verbne Lake (2012), n=1	Al	9.3	2.4	0.3	0.5	3.4
	Cu	11.3	7.2	1.6	1.1	3.0
Verbne Lake (2017), n=2	Al	8.3–12.4 10.4	0.0–2.7 1.4	0.2–0.4 0.3	0.2–0.4 0.3	0.7–1.7 1.2
	Fe	11.8–110.3 62.0	0.0–18.8 9.4	1.3–2.5 1.9	1.0–1.7 1.4	1.2–2.1 1.7
The second Kytayivsky pond (2011–2012), n=6	Al	4.2–42.8 16.4	0.3–17.0 8.3	0.1–3.2 1.0	0.2–4.5 1.4	0.5–8.1 2.3
	Fe	21.1–145.6 69.1	6.2–36.9 18.5	0.4–4.0 1.4	0.0–9.1 2.1	2.5–14.4 8.0
	Cu	8.7–23.7 15.6	0.9–5.3 2.8	0.5–3.8 2.0	0.9–4.3 2.2	1.0–4.3 2.4
The second Horikhuvatsky pond (2013), n=3	Al	18.0–104.2 51.8	0.5–3.9 2.6	1.0–6.7 3.0	0.8–10.8 4.4	3.0–8.2 5.3
	Fe	30.8–70.4 49.5	0.0–5.1 2.1	0.0–3.0 1.6	1.8–11.0 5.2	1.4–5.7 3.1
	Cu	6.4–6.8 6.6	0.0–1.9 0.9	0.3–1.8 1.0	0.1–0.7 0.5	1.2–3.8 2.1

Note: above and below the line are the limit and average values, n – the number of samples.

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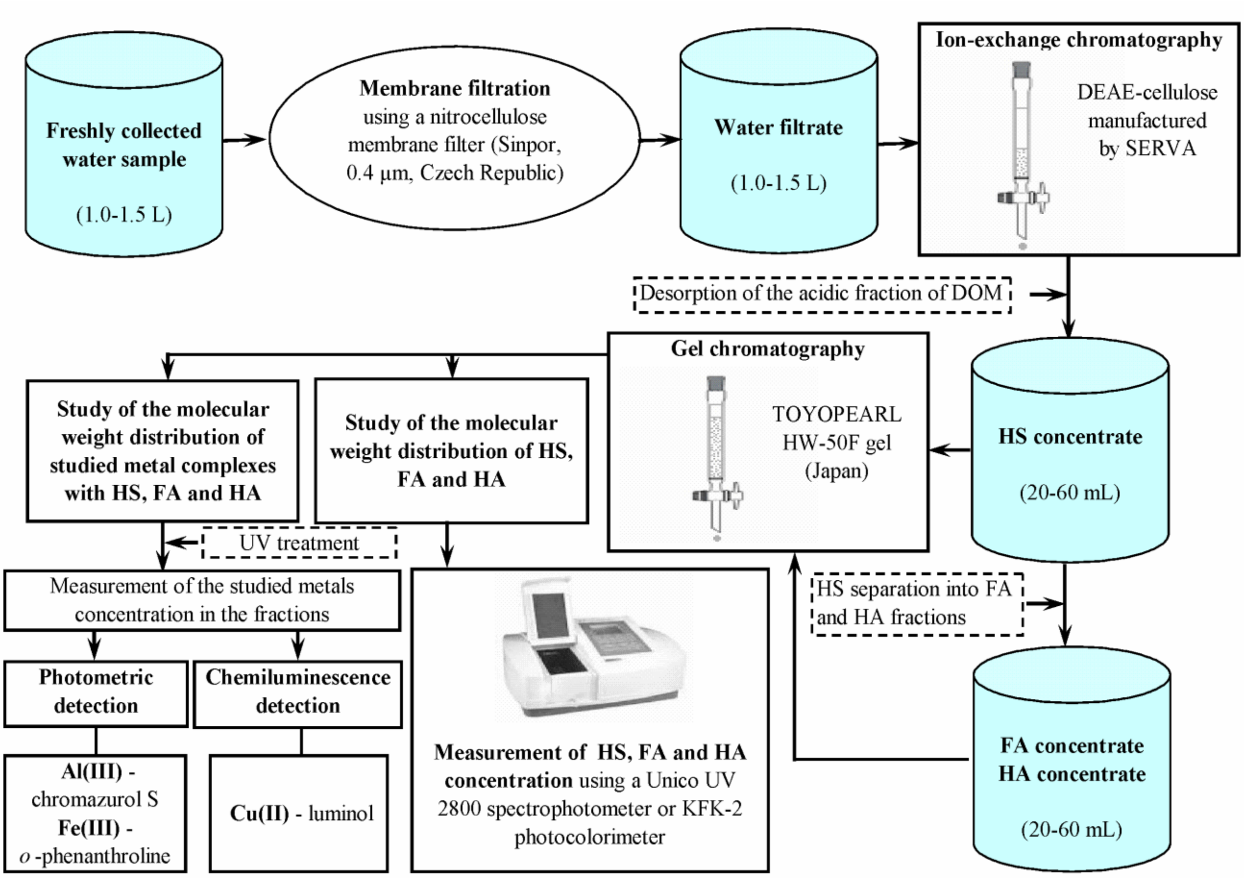

Figure S1. Scheme of the study of the role of HS' various fractions in binding of Al(III), Fe(III), and Cu(II) into complexes.

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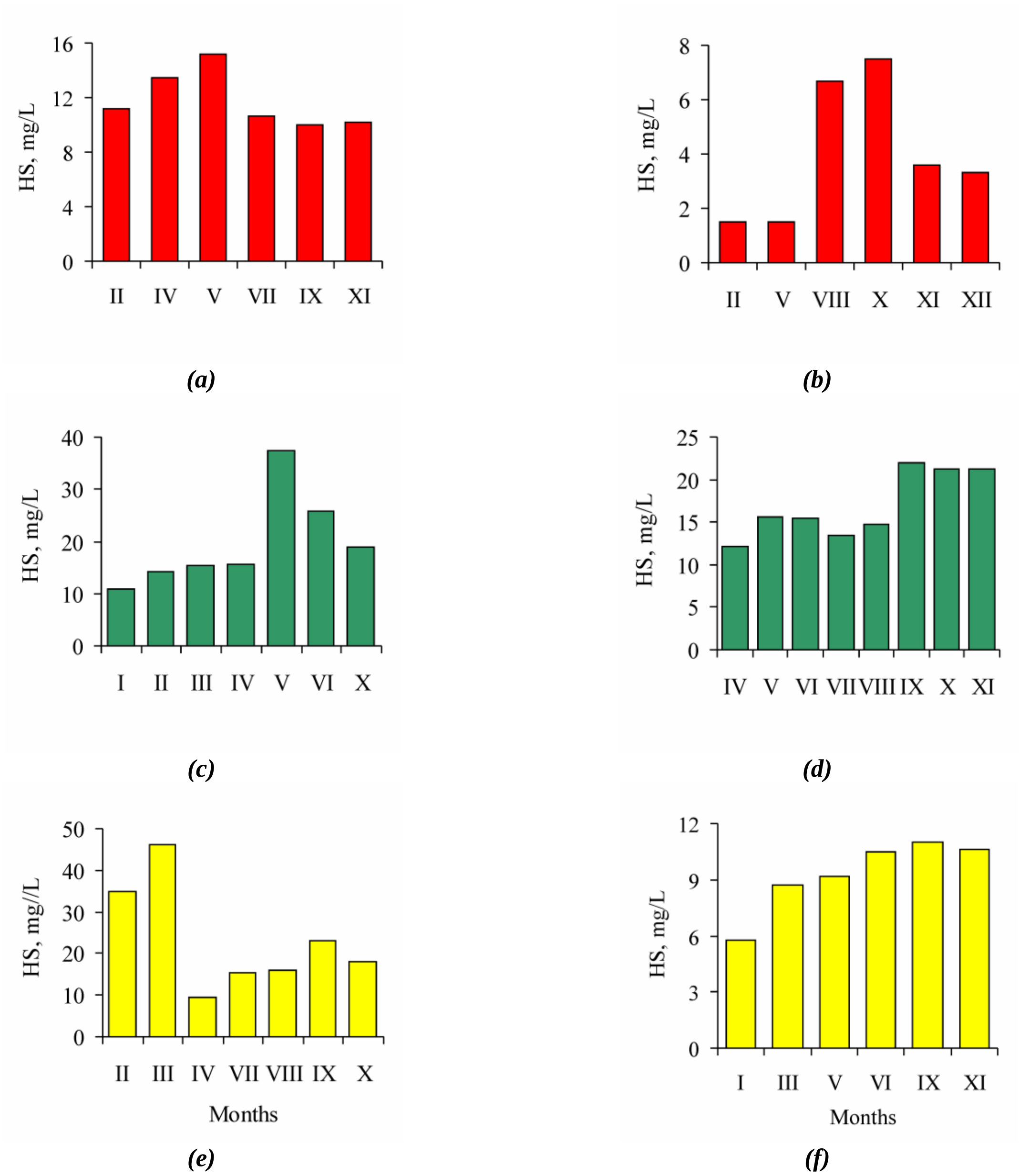

Figure S2. Temporal changes of HS concentration in the water bodies of the first *(a, c, e)* and second *(b, d, f)* types: *(a)* – Desna River, 2011, *(b)* – Seret River, 2011, *(c)* – Kaniv Reservoir, 2012, *(d)* – Yurpil Reservoir, 2012, *(e)* – Lutsymer Lake, 2011, *(f)* – the second Kytayivsky pond, 2011.

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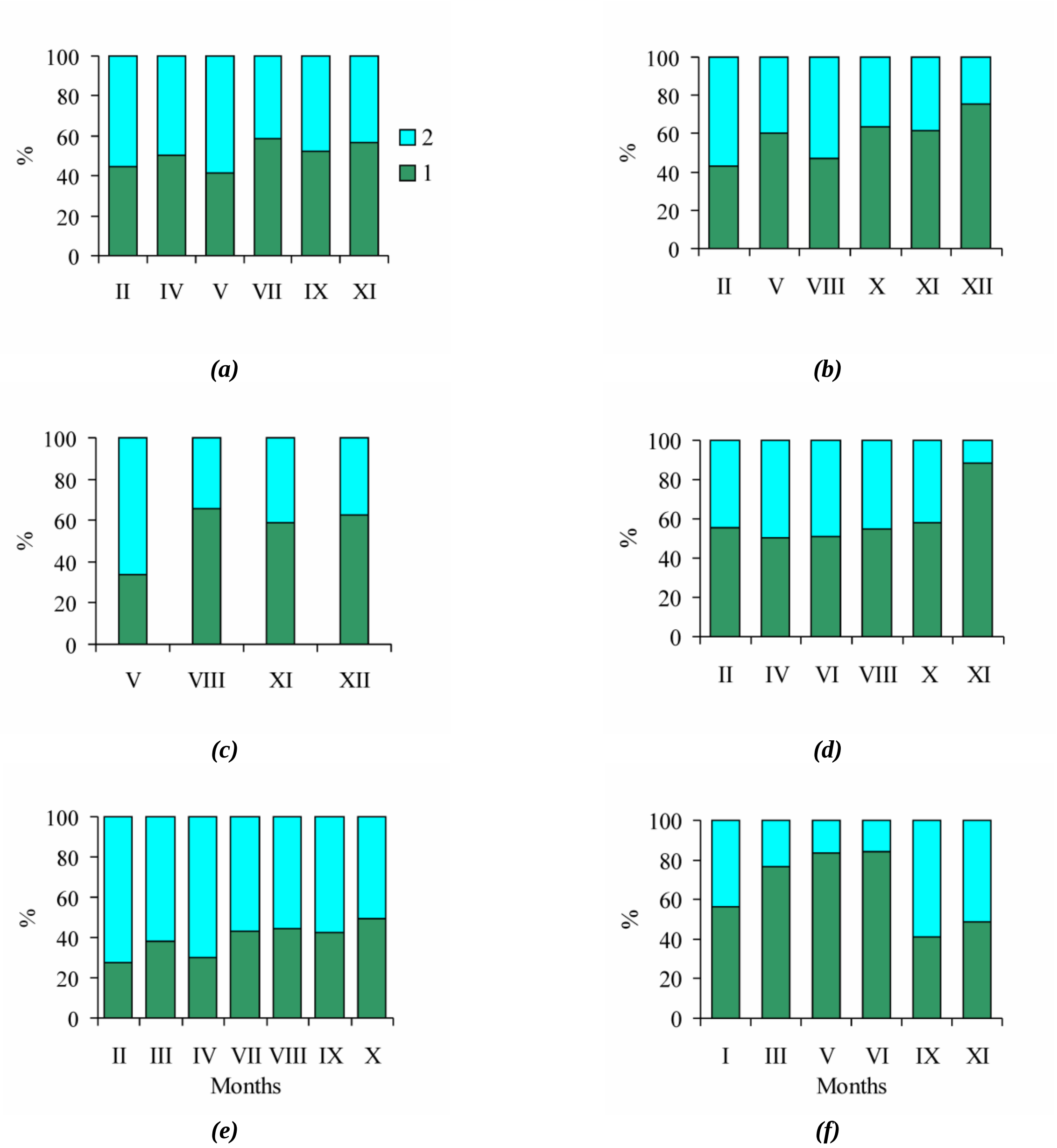

Figure S3. Temporal changes in the share of autochthonous (1) and allochthonous (2) DOM in water bodies of the first *(a, c, e)* and second *(b, d, f)* types: *(a)* – Desna River, 2011, *(b)* – Seret River, 2011, *(c)* – Desenka arm, 2011, *(d)* – Ternopil Reservoir, 2011, *(e)* – Lutsymer Lake, 2011, *(f)* – the second Kytayivsky pond, 2011.

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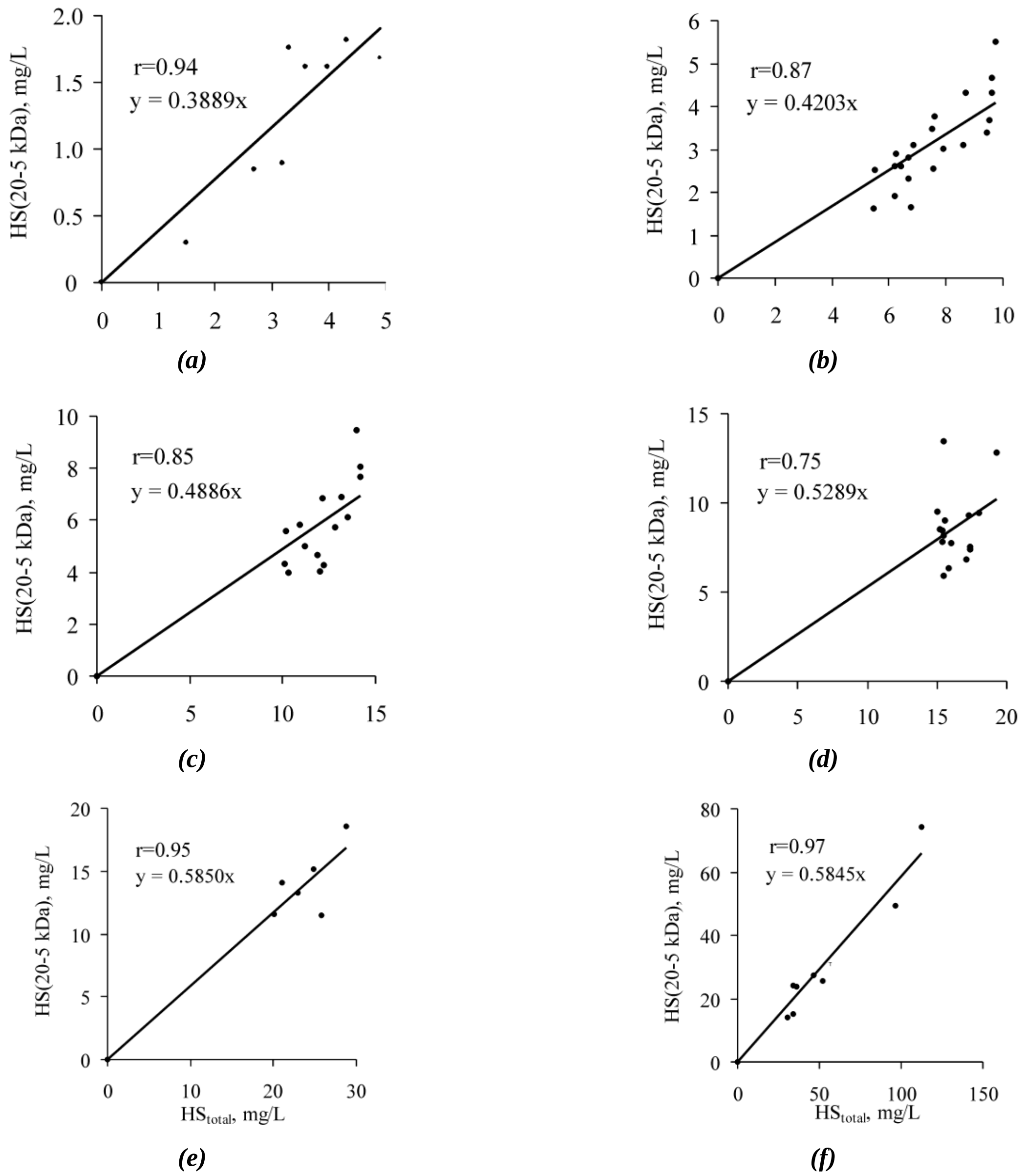

Figure S4. Correlation between the total concentration of HS (HS_{total}) and the concentration of HS with a molecular weight of 20–5 kDa in the water bodies under study, ranked by the content of HS_{total}: *(a)* – 0–5, *(b)* – 5–10, *(c)* – 10–15, *(d)* – 15–20, *(e)* – 20–30 and *(f)* – >30 mg/L.