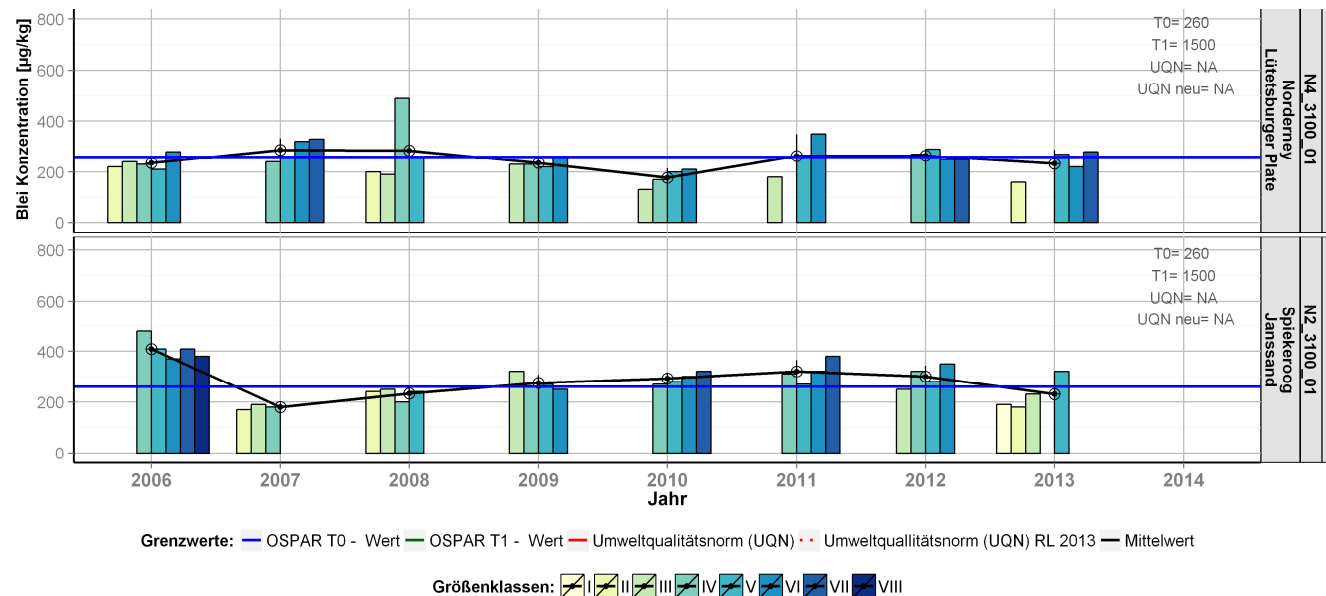


Umsetzung der MSRL an der niedersächsischen Küste: Deskriptor 8 - Schadstoffe

Weiterentwicklung der Grundlagen einer Schadstoffbewertung – Situationsbewertung und Handlungsoptionen

Anhang II: Grafische Darstellungen

Dezember 2014



Inhalt

Einleitung	1	
1. Blei.....	3	
1.1 Wasser	3	
1.2 Sediment	7	
1.3 Biota	10	
2. Cadmium.....	15	
2.1 Wasser	15	
2.2 Sediment	19	
2.3 Biota	22	
3. Nickel	27	
3.1 Wasser	27	
3.2 Sediment	31	
4. Quecksilber	34	
4.1 Wasser	34	
4.2 Sediment	38	
4.3 Biota	41	
5. Hexachlorbenzol	46	
5.1 Wasser	46	
5.2 Sediment	50	
5.3 Biota	53	
6. Pentachlorbenzol	58	
6.1 Wasser	58	
6.2 Sediment	62	
7. Benzo(a)pyren	65	
7.1 Sediment	65	
7.2 Biota	68	
8. Benzo(ghi)perylen.....	73	
8.1 Sediment	73	
8.2 Biota	76	
9. Indeno(1,2,3-cd)pyren.....	81	
9.1 Sediment	81	
9.2 Biota	84	
10. Fluoranthen	89	
10.1 Sediment	89	
10.2 Biota	92	
11. Dibutylzinn-Kation	97	
11.1 Sediment	97	
12. Tributylzinn-Kation	100	
12.1 Sediment	100	
13. Tetraethylzinn.....	103	
13.1 Sediment	103	

Einleitung

Der vorliegende Anhangsband beinhaltet die grafische Darstellung der Schadstoffkonzentrationen in den Kompartimenten Wasser, Sediment und Biota. Zur Orientierung ist in den Fußzeilen jeweils der behandelte Schadstoff angegeben, sowie ein Symbol für das jeweilige Kompartiment:

 Wasser	 Sediment	 Muscheln	 Fische
--	--	--	--

Die Grafiken sind zunächst nach den einzelnen Stoffen und in zweiter Ebene nach den Kompartimenten gegliedert. Die Daten der einzelnen Stationen werden als Zeitreihe in Linien- oder Balkendiagrammen dargestellt, wobei sich die Reihenfolge an der Lage der Stationen entlang der niedersächsischen Küste orientiert (von West nach Ost). Stationen innerhalb einer Flussgebietseinheit werden jeweils auf einer Seite dargestellt.

Den Diagrammen zu den einzelnen Stationen ist jeweils eine Boxplot-Darstellung vorangestellt, die die Daten aller Stationen zusammenfassend zeigt. Die Boxplots geben eine Übersicht der Schwankungsbreite der gemessenen Konzentrationen und bieten einen guten Überblick der einzelnen Stationen im Vergleich. Sie beinhalten aber keine Aussagen zum zeitlichen Verlauf der Messwerte. Die farbigen Punkte stellen jeweils einen Messwert dar, schwarze Punkte markieren Ausreißer. Das Kriterium für einen als Ausreißer klassifizierten Wert ist der Abstand vom Mittelwert (Vielfaches der Standardabweichung der Variablen). Im Rahmen der Analysen wurden detektierte Ausreißerwerte nicht aus dem Datensatz entfernt, da die Ursache nicht geklärt werden konnte und nicht auszuschließen ist, dass es sich um „korrekte“ Messwerte handelt.

In allen Diagrammen sind die vorhandenen Grenz- oder Richtwerte eingetragen, soweit sie sich innerhalb der dargestellten Skalenhöhe befinden. Eine Information zu den relevanten Richtwerten befindet sich in den Boxplots jeweils in der rechten Spalte (NA = not available). Dargestellt werden (soweit vorhanden) die UQN der OGewV, die neuen UQN der Richtlinie 2013/39/EU (UQN_neu) sowie zusätzlich für die Schwermetalle die ehemals für unfiltrierte Wasserproben geltenden UQN der Richtlinie 2000/60/EG (UQN_alt). Für die Kompartimente Sediment und Biota werden außerdem die OSPAR-Richtwerte dargestellt. Neben dem Stationsnamen enthalten alle Diagramme Angaben zu Wasserkörper und Flussgebietseinheit, in denen sich die jeweilige Station befindet.

Daten unterhalb der Bestimmungsgrenze (BG) gehen mit 0,5 mal BG in die Analyse und Darstellung ein. Hinweis: Bei den Sedimentdaten ist nach der Normalisierung auf 2,5 % TOC in den Diagrammen nicht mehr erkennbar, ob die Werte unter der BG lagen.

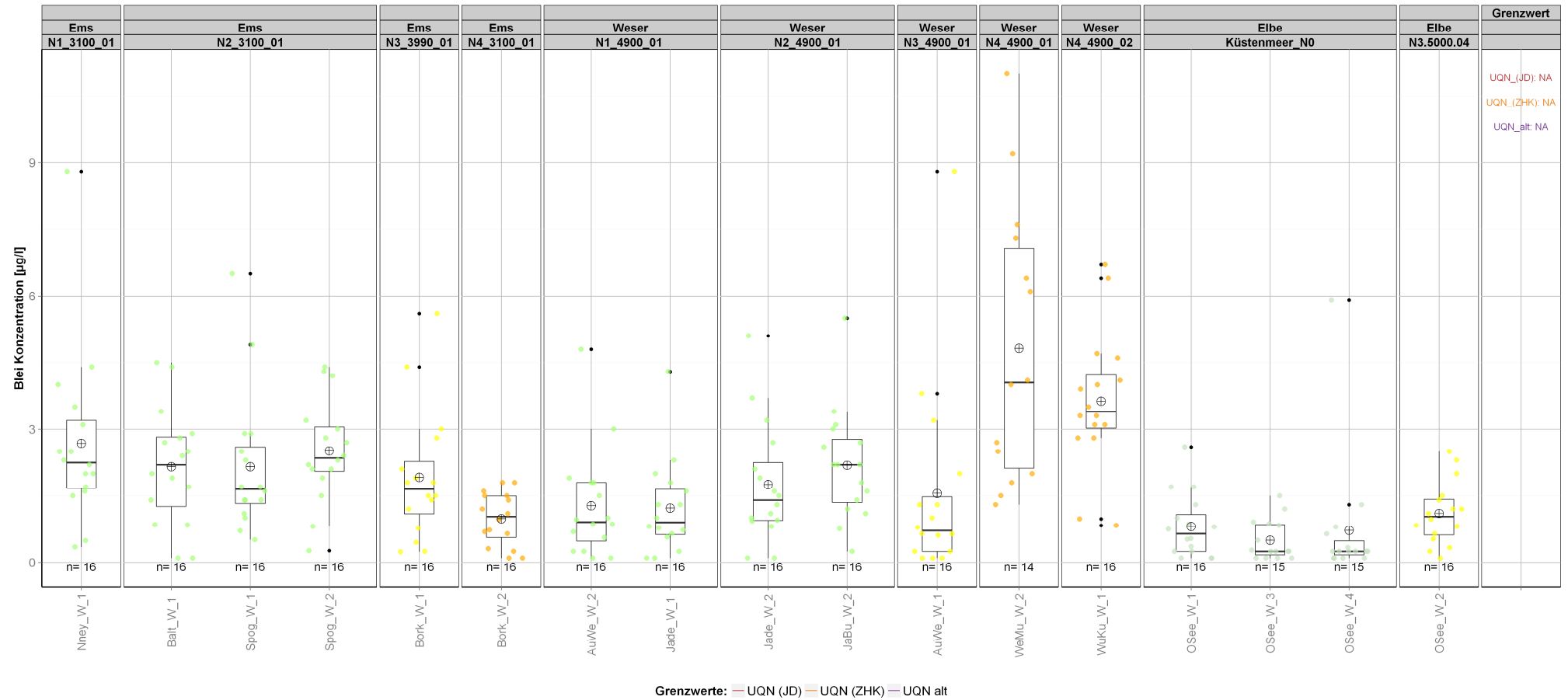
In den Linien- bzw. Balkendiagrammen sind zusätzlich die Ergebnisse der Trendanalyse (Mann-Kendall Test) angegeben:

-  signifikant steigend
-  signifikant fallend
-  kein signifikanter Trend

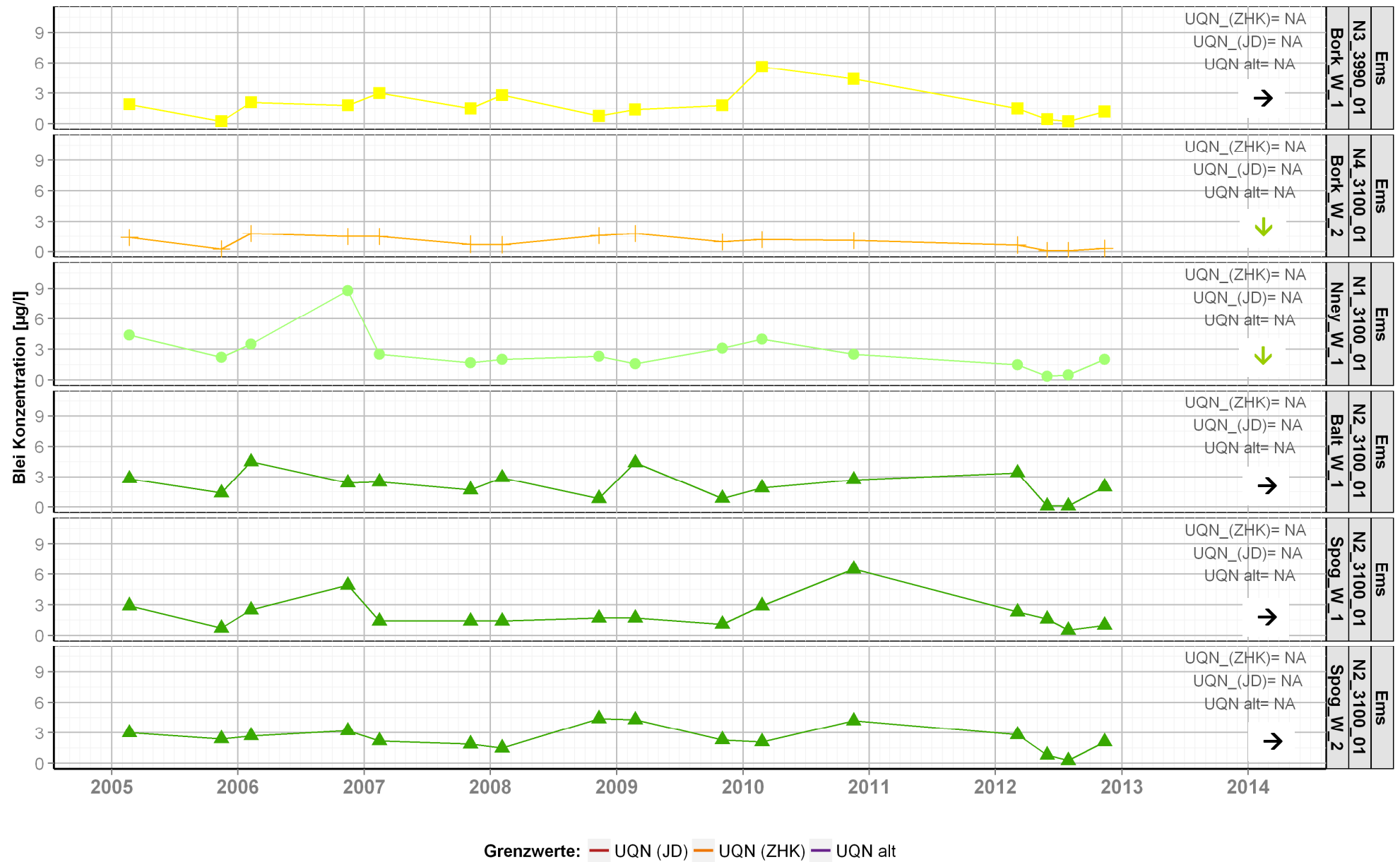
Für diejenigen Stoffe, bei denen ein Großteil der Daten unterhalb der Bestimmungsgrenzen liegt, wurde keine Trendbetrachtung durchgeführt. Außerdem konnten keine Stationen getestet werden, bei denen weniger als fünf Messwerte vorlagen.

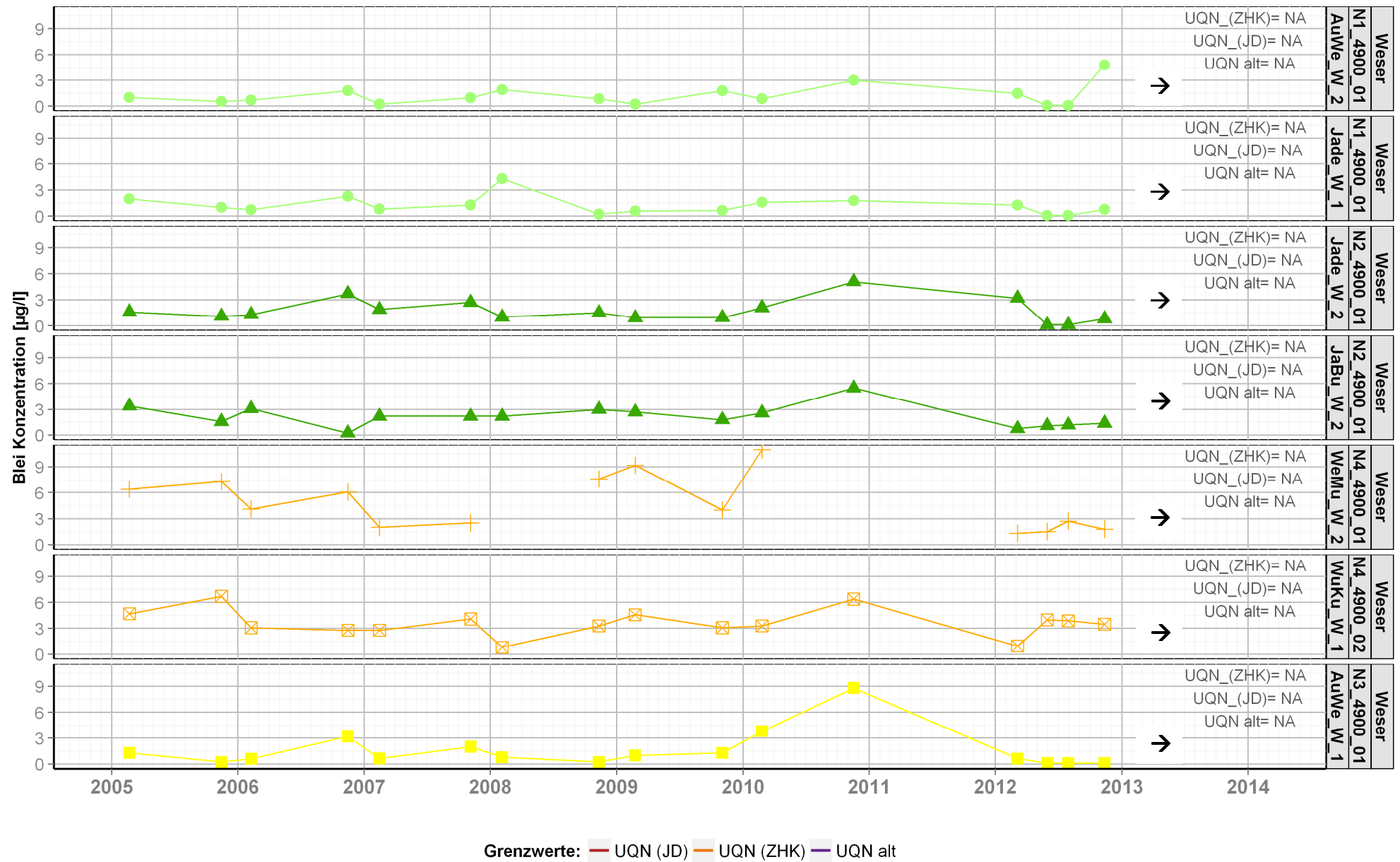
1. Blei

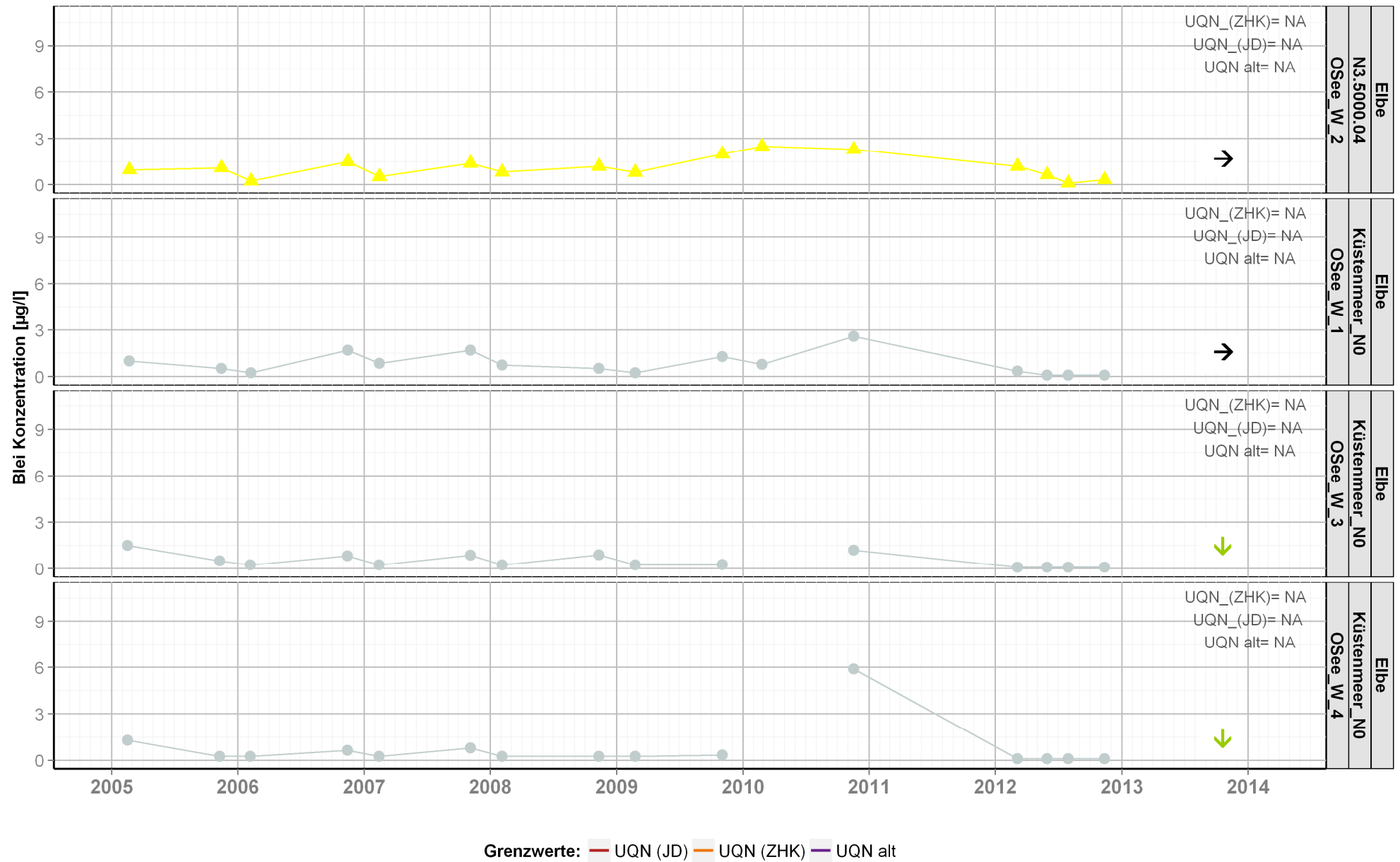
1.1 Wasser



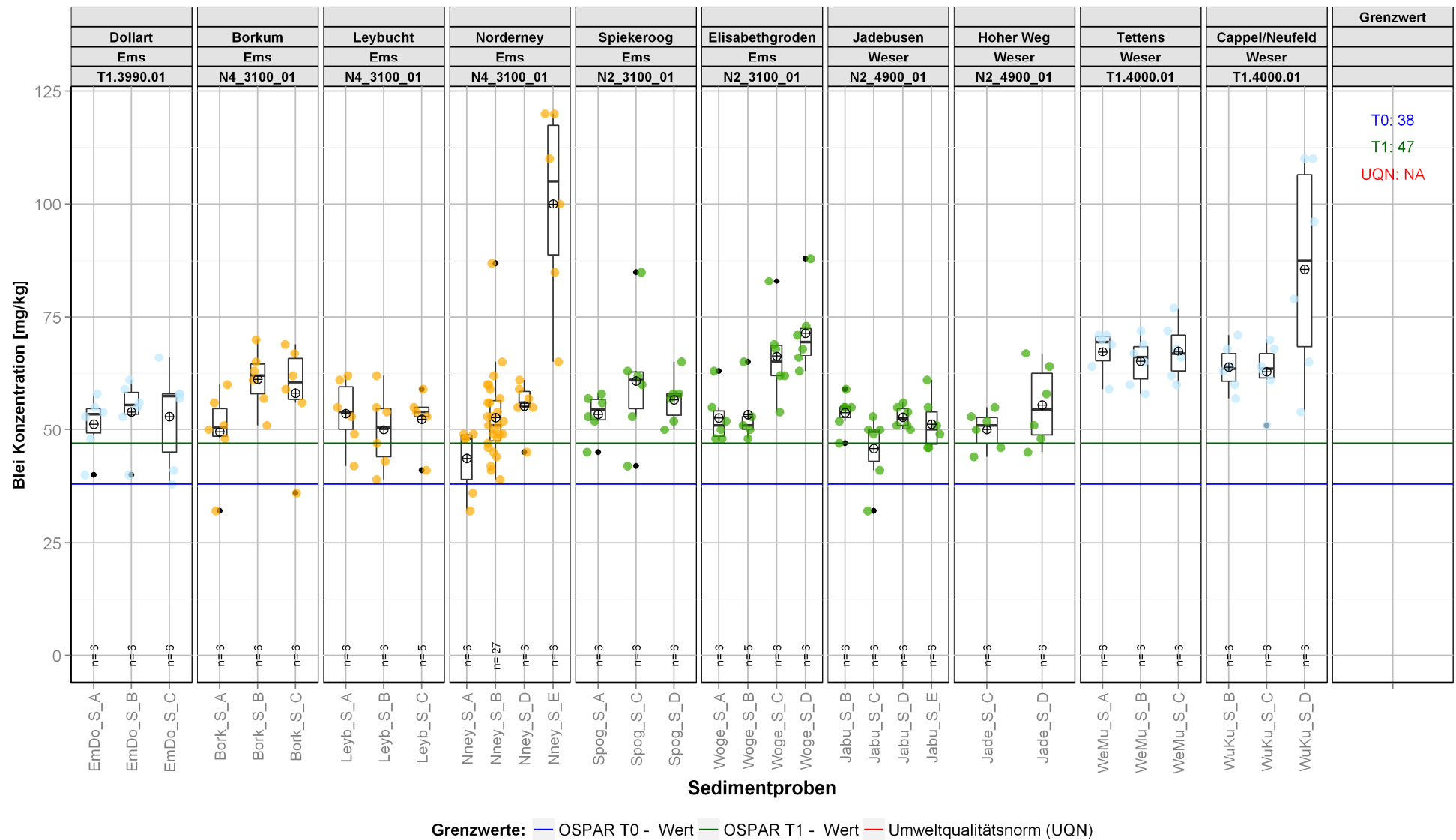
Bestimmungsgrenzen: 2005-2009: 0,5 µg/l; 2012: 0,2 µg/l

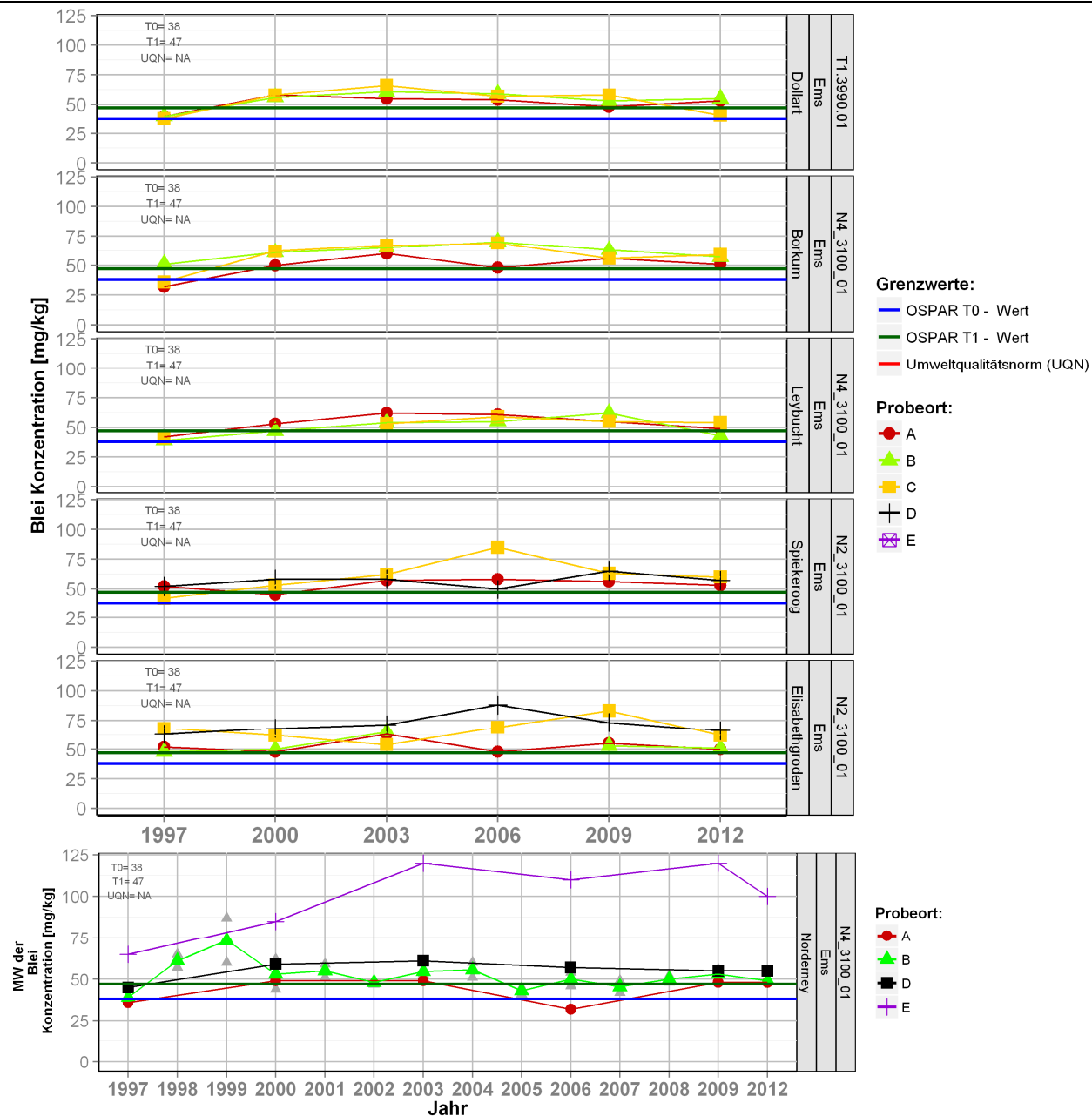






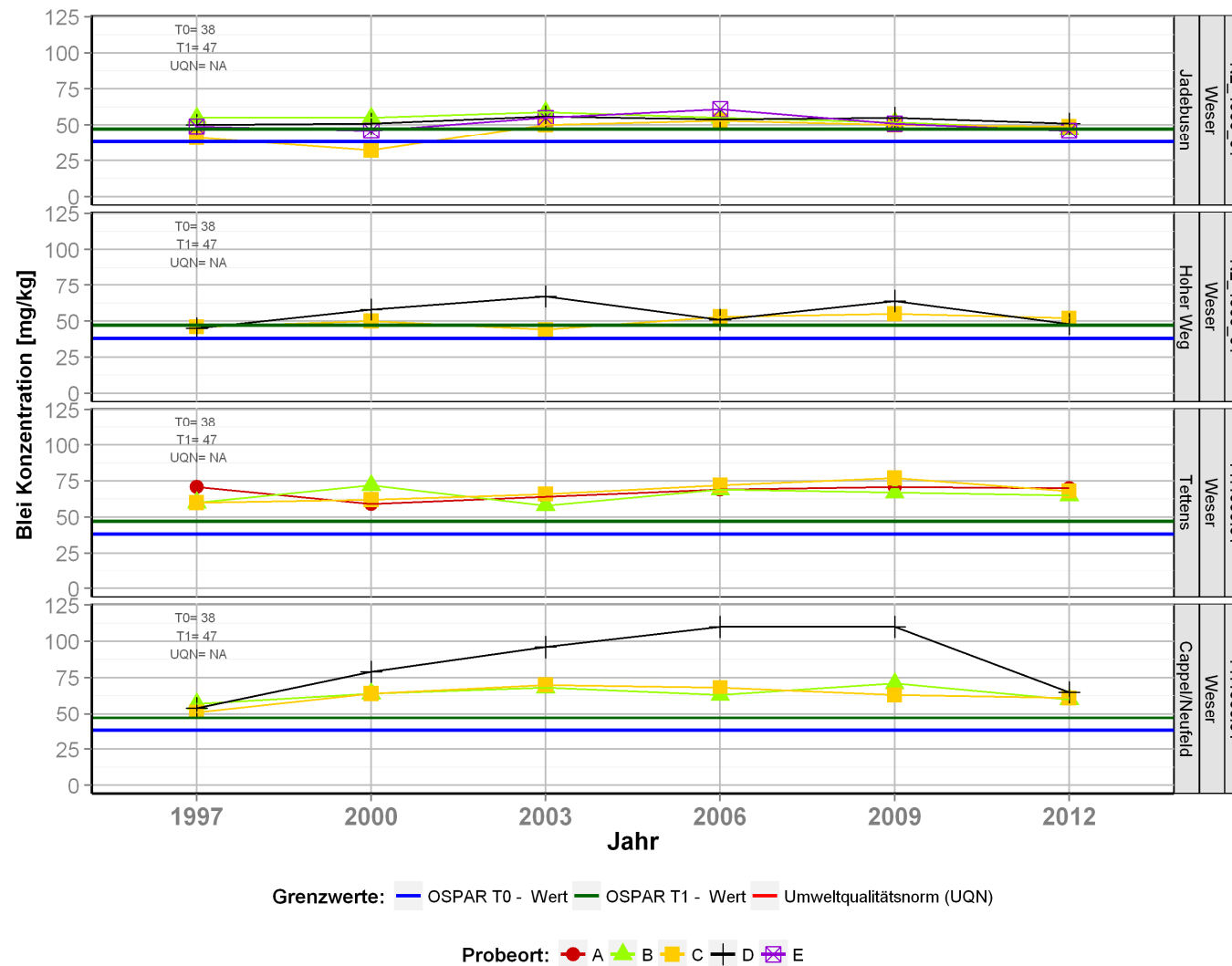
1.2 Sediment





Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	→
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	→
Leyb_S_C	→
Spog_S_A	→
Spog_S_C	→
Woge_S_A	→
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	↓
Nney_S_D	→

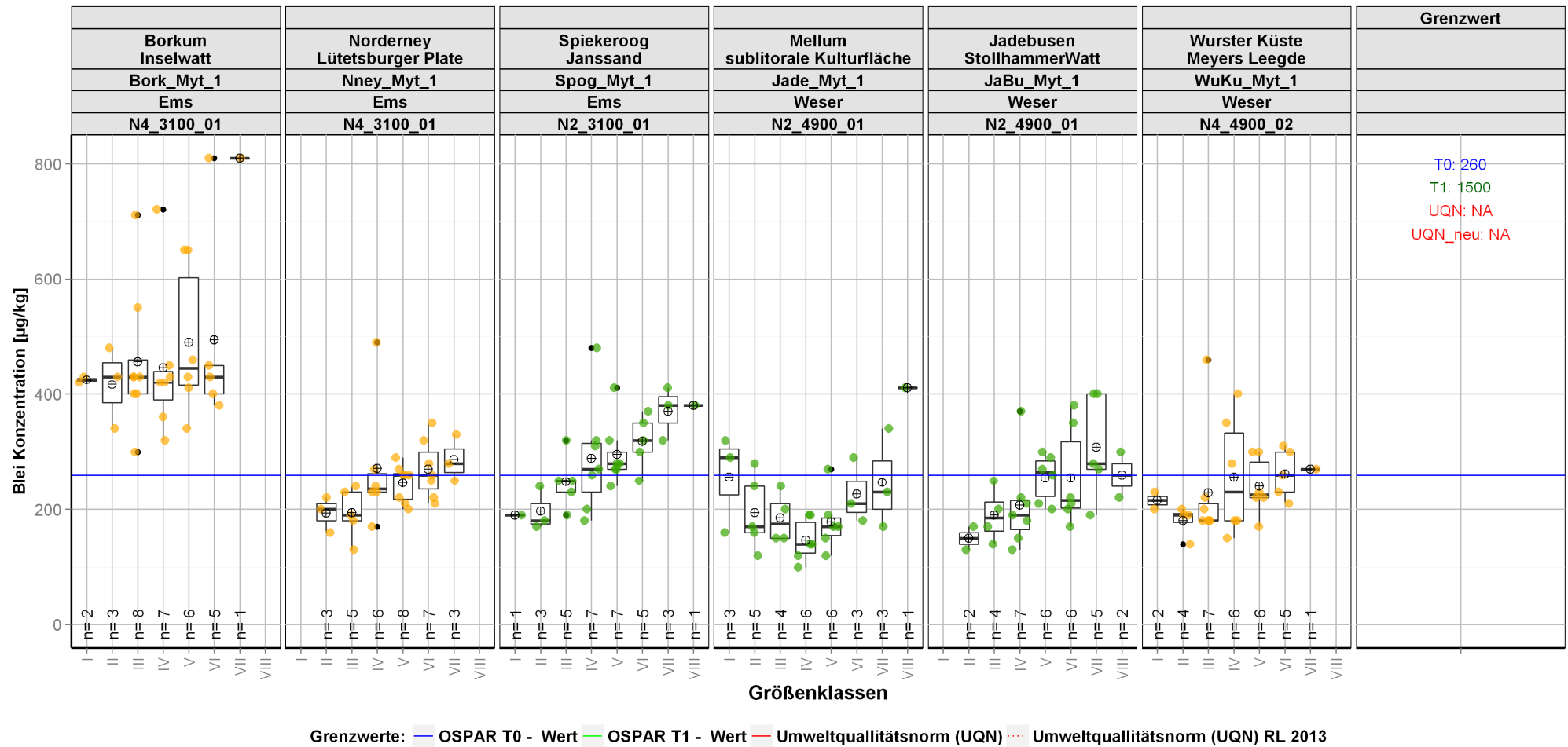


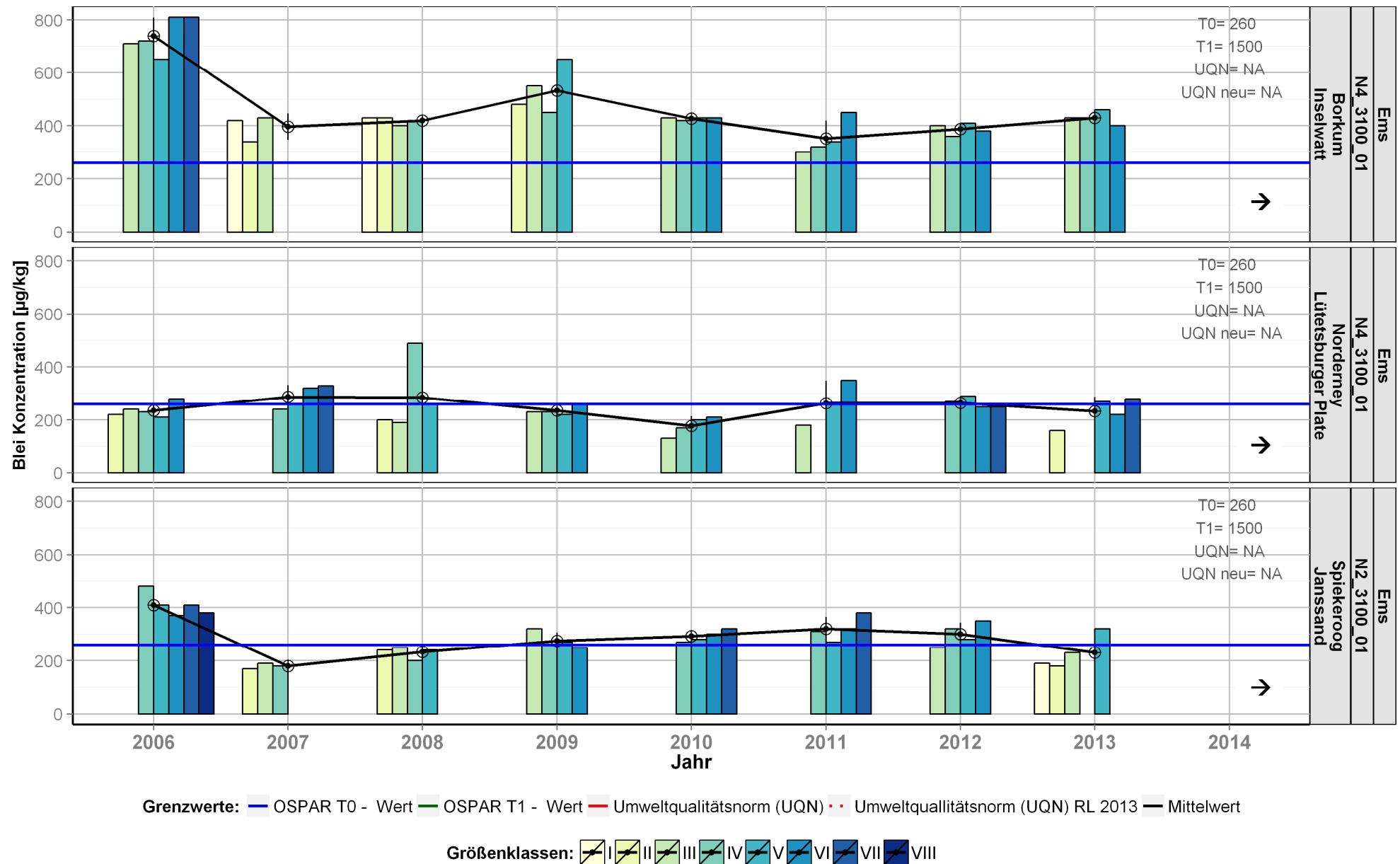


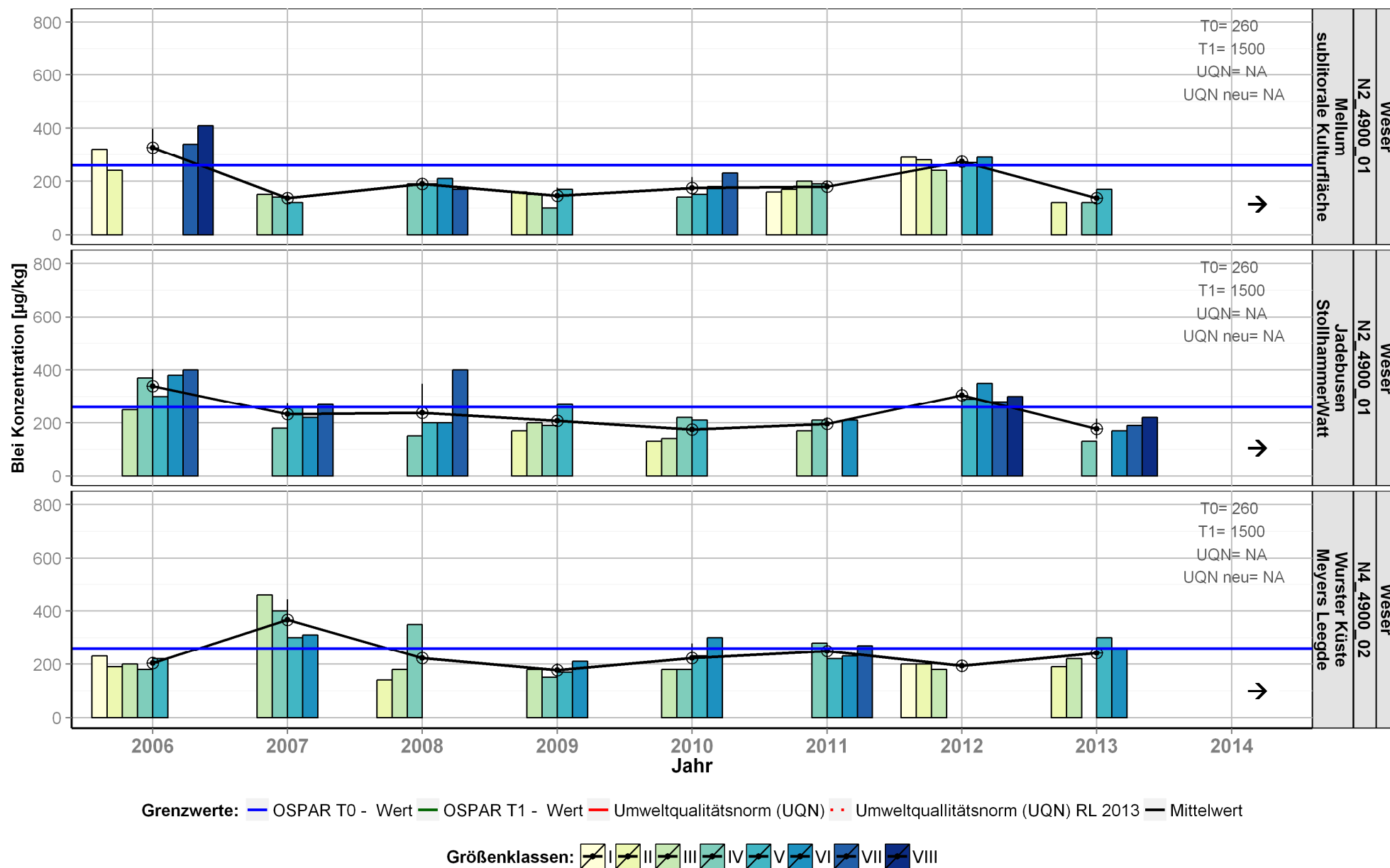
Station	Trend
Jabu_S_B	→
Jabu_S_C	→
Jabu_S_D	→
Jabu_S_E	→
Jade_S_C	→
Jade_S_D	→
WeMu_S_A	→
WeMu_S_B	→
WeMu_S_C	↑
WuKu_S_B	→
WuKu_S_C	→
WuKu_S_D	→

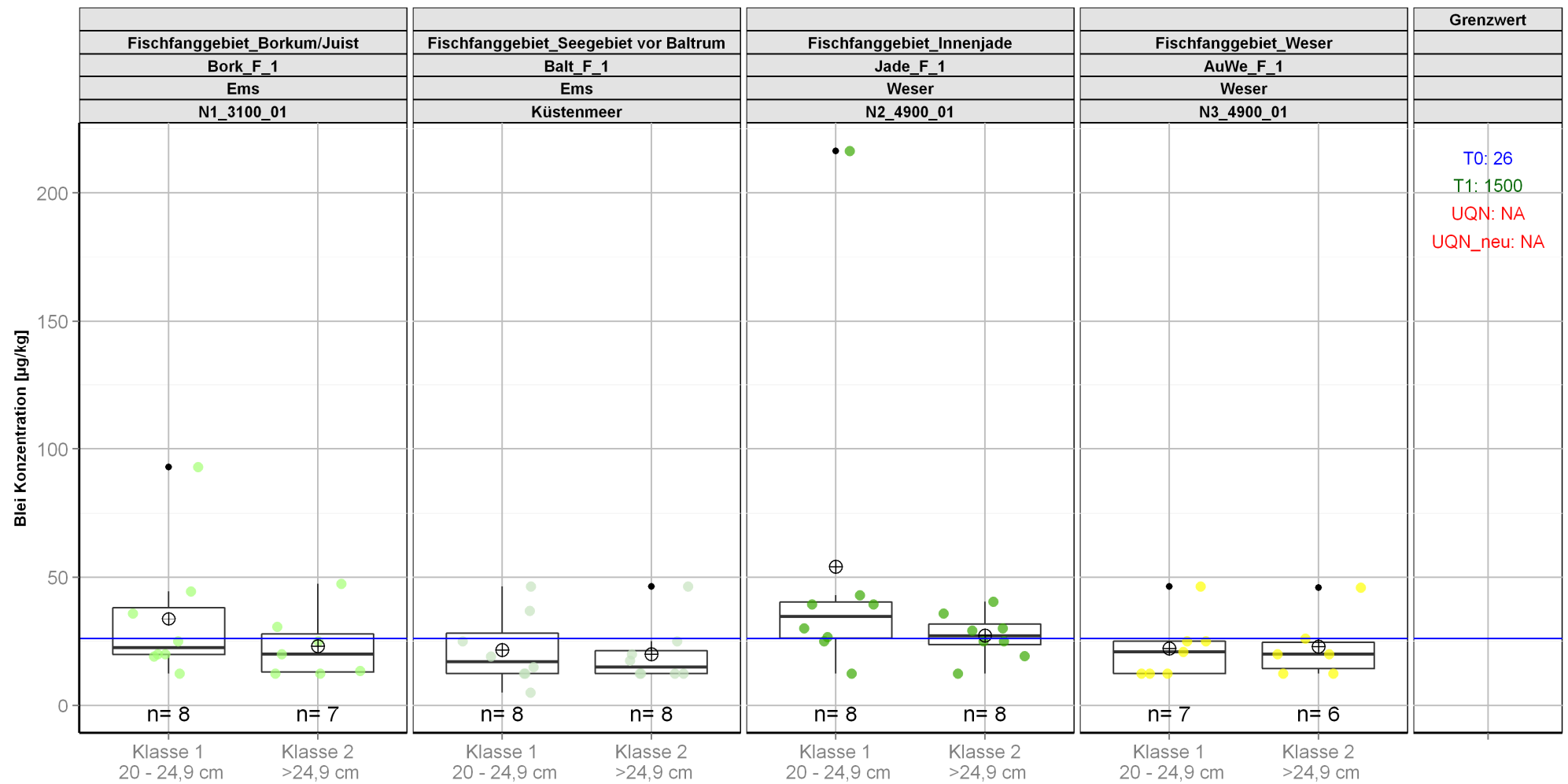


1.3 Biota

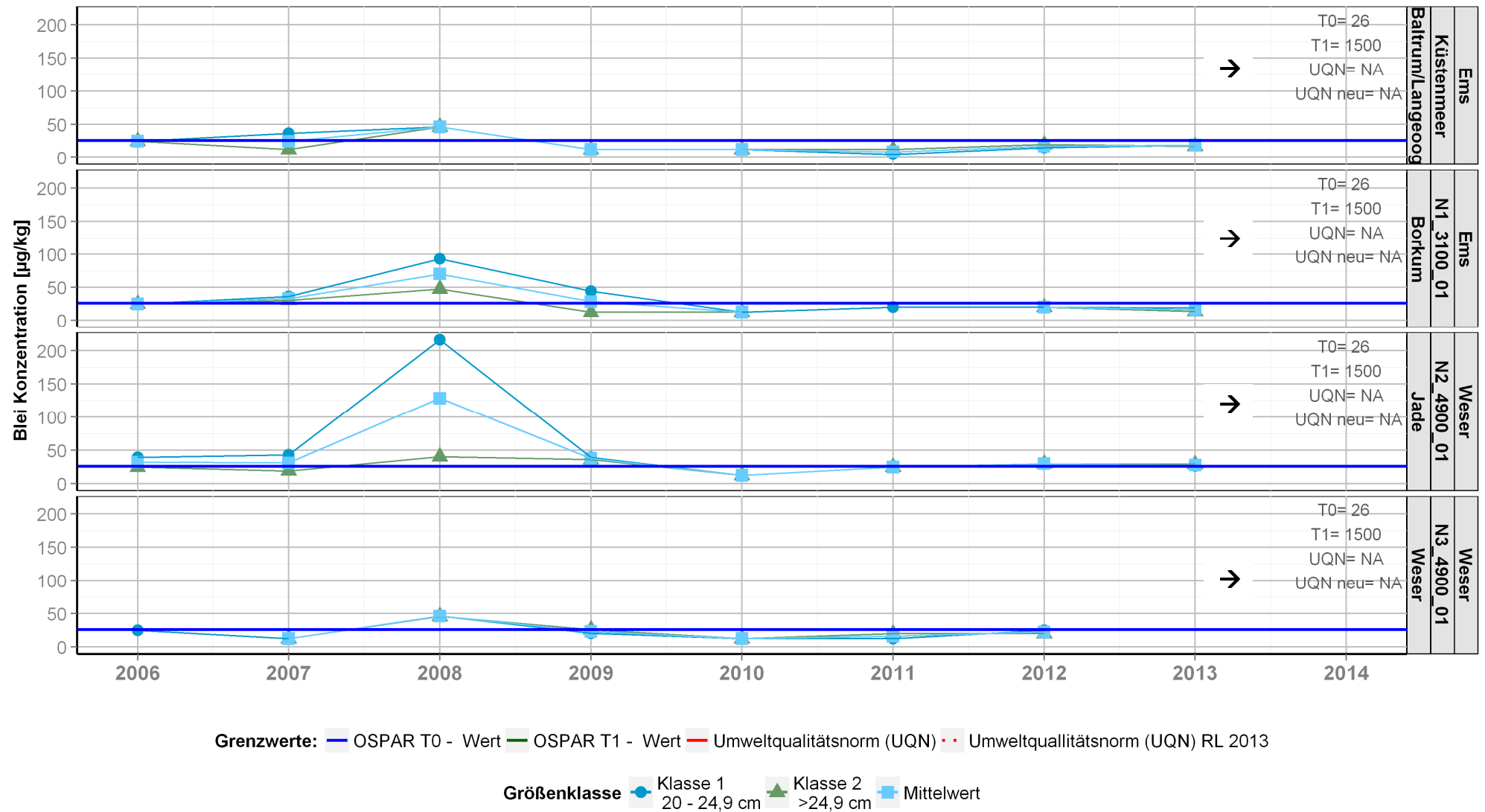








Grenzwerte: — OSPAR T0 - Wert — OSPAR T1 - Wert — Umweltqualitätsnorm (UQN) - - Umweltqualitätsnorm (UQN) RL 2013



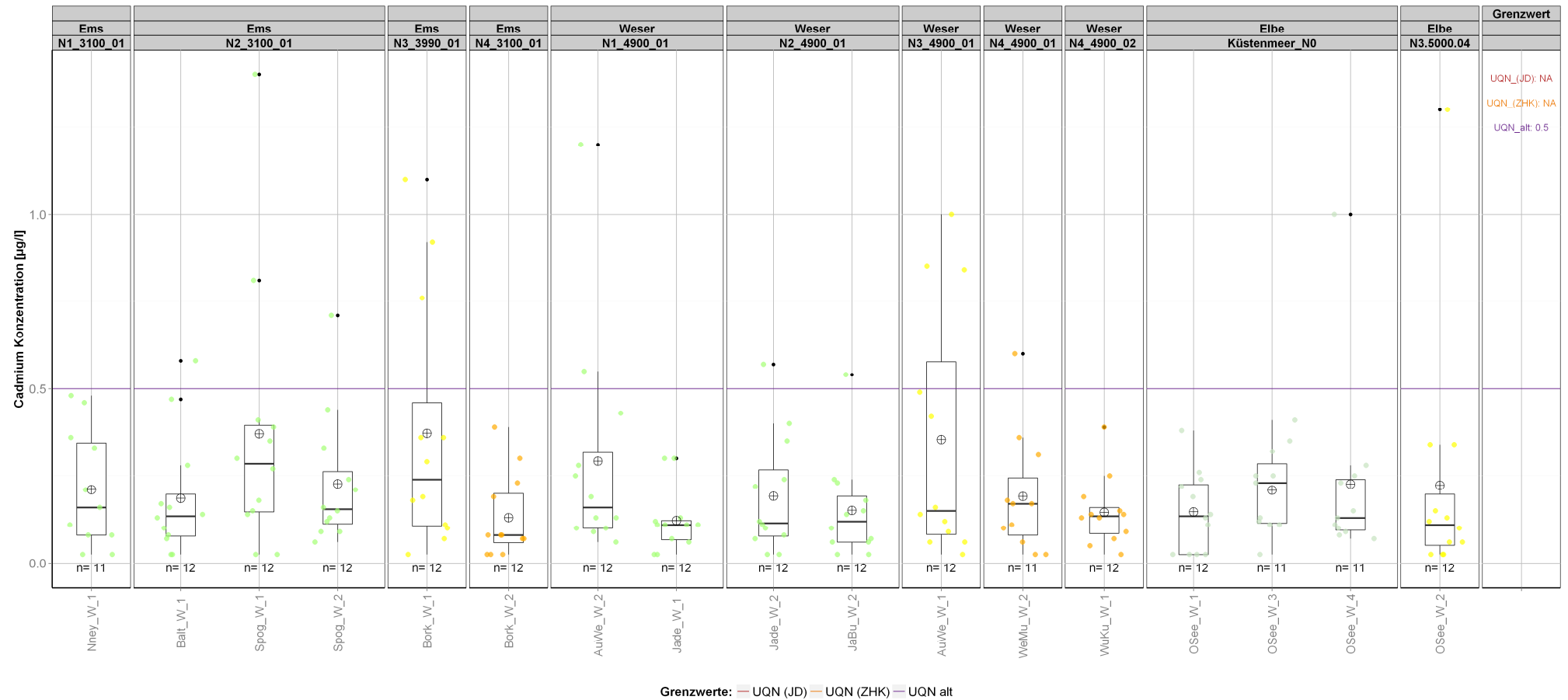
Bestimmungsgrenzen:

2006: 50; 2007-2010: 25; 2011: 10 µg/kg



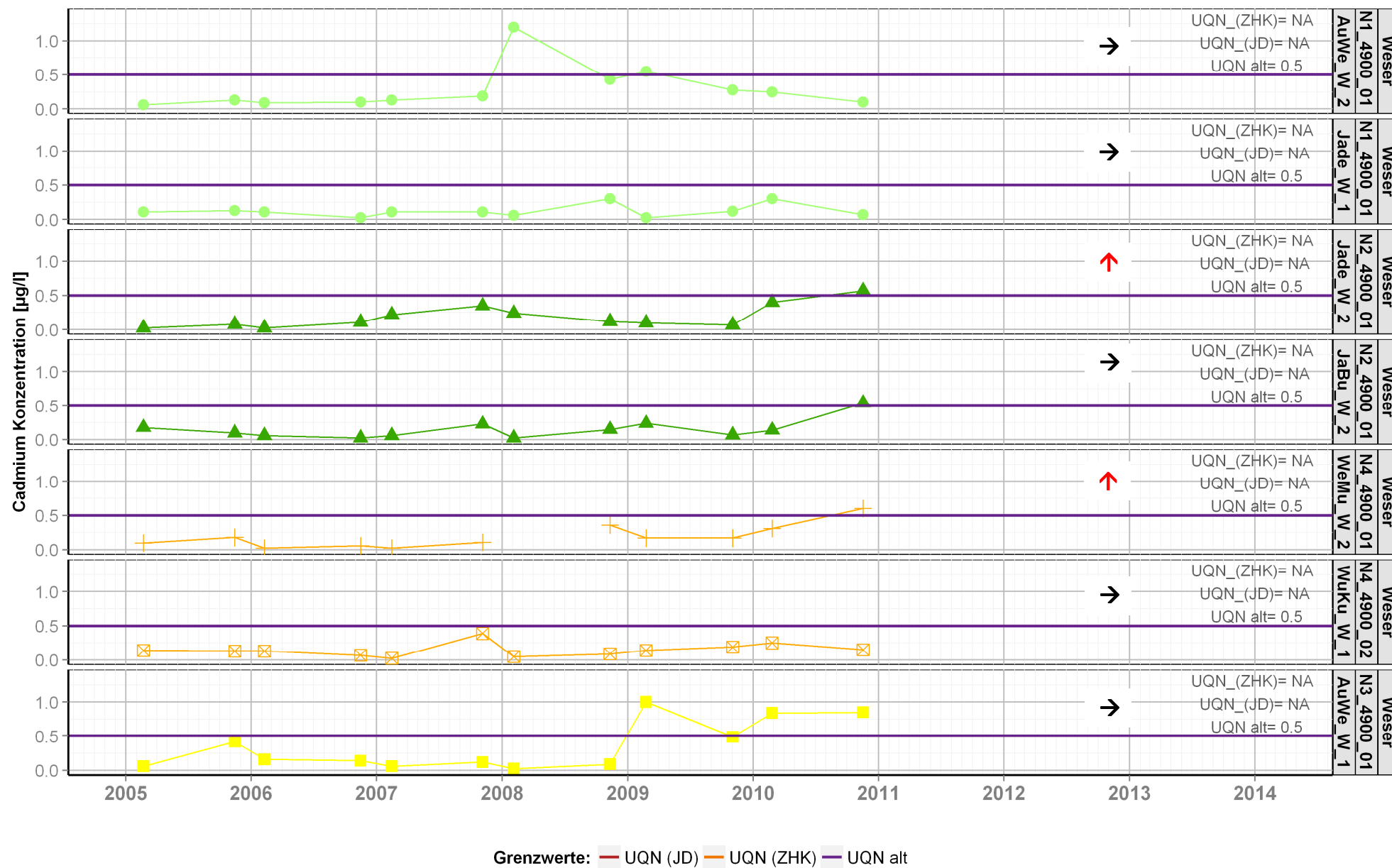
2. Cadmium

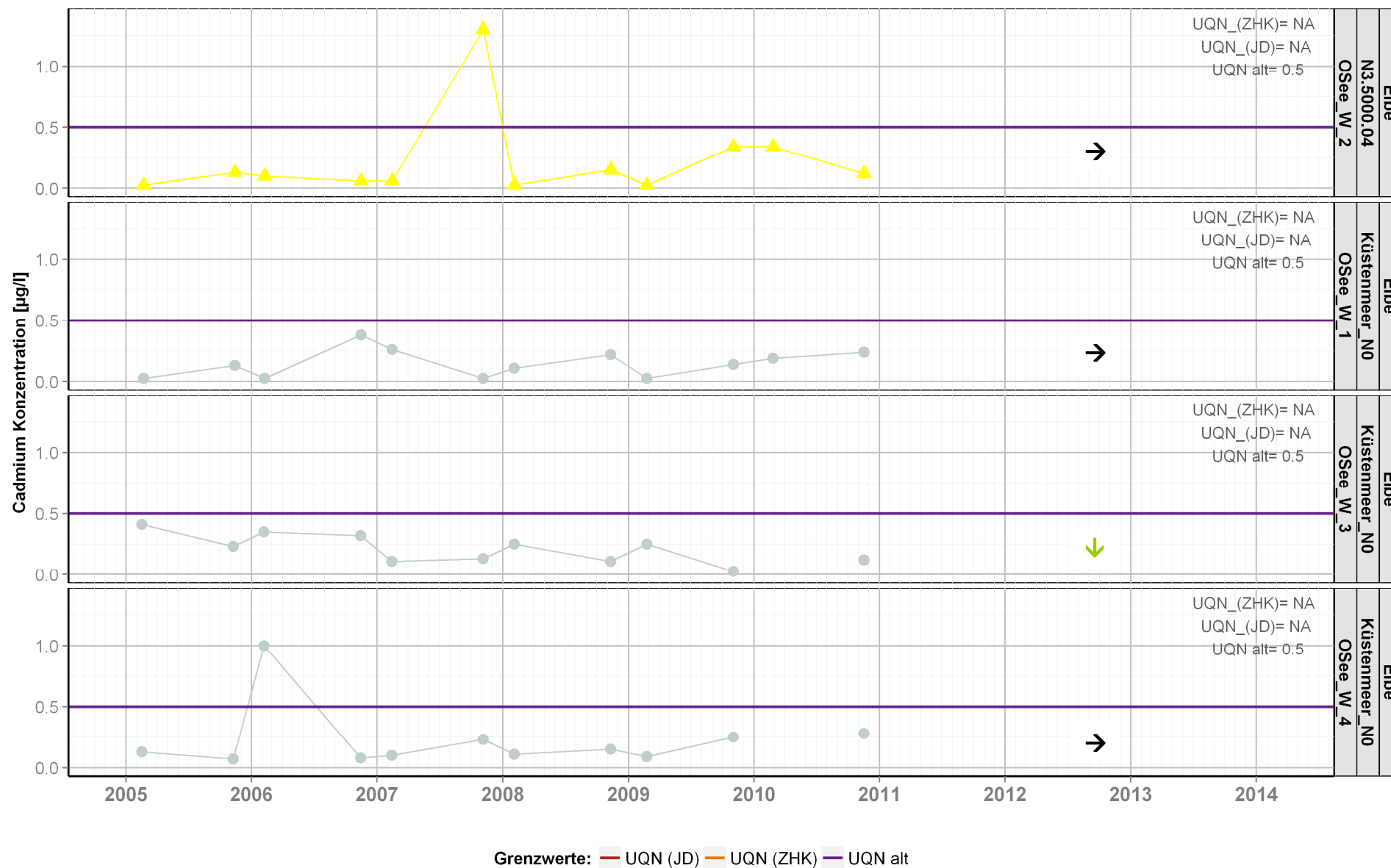
2.1 Wasser



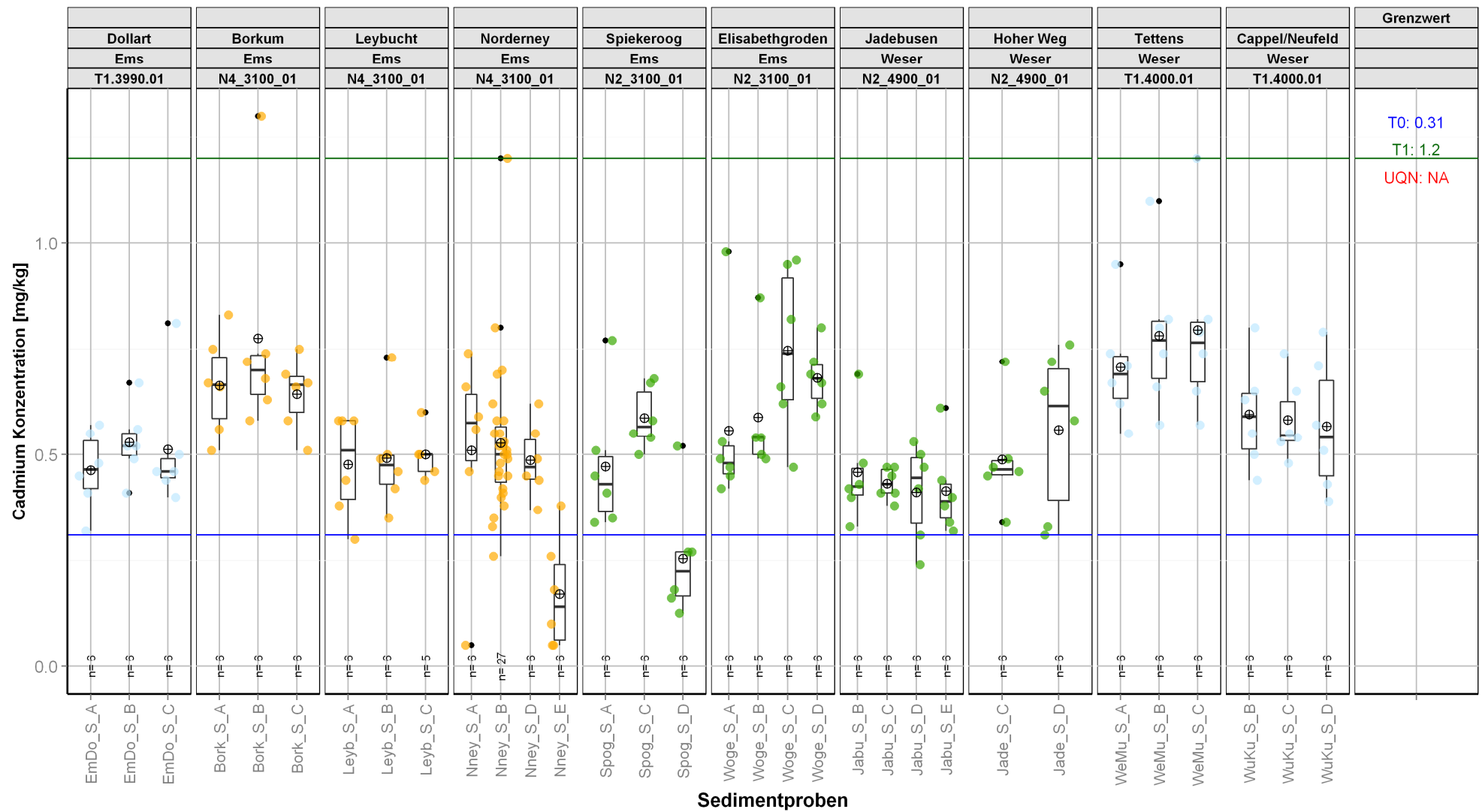
Bestimmungsgrenze: 0,05 µg/l





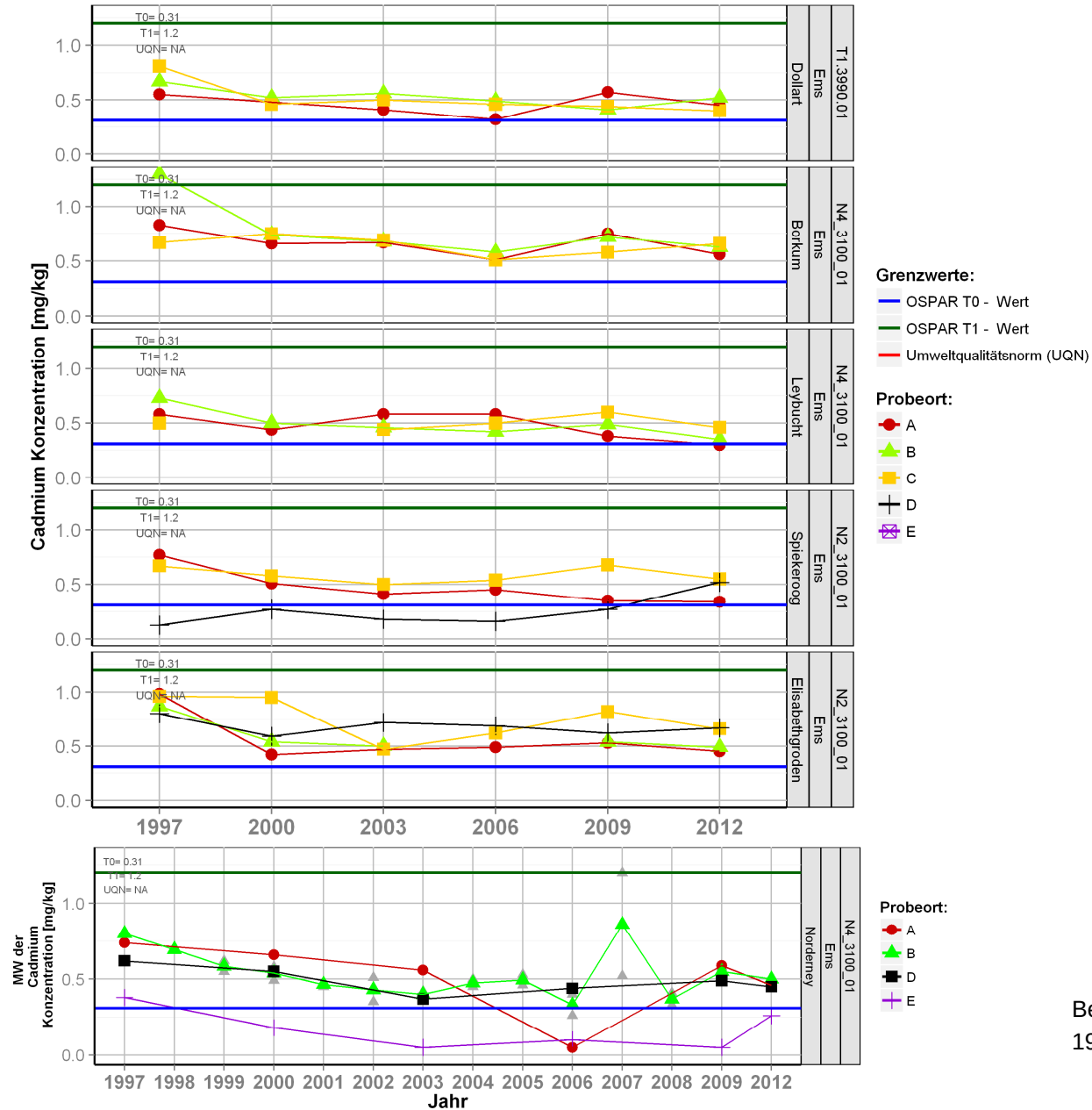


2.2 Sediment



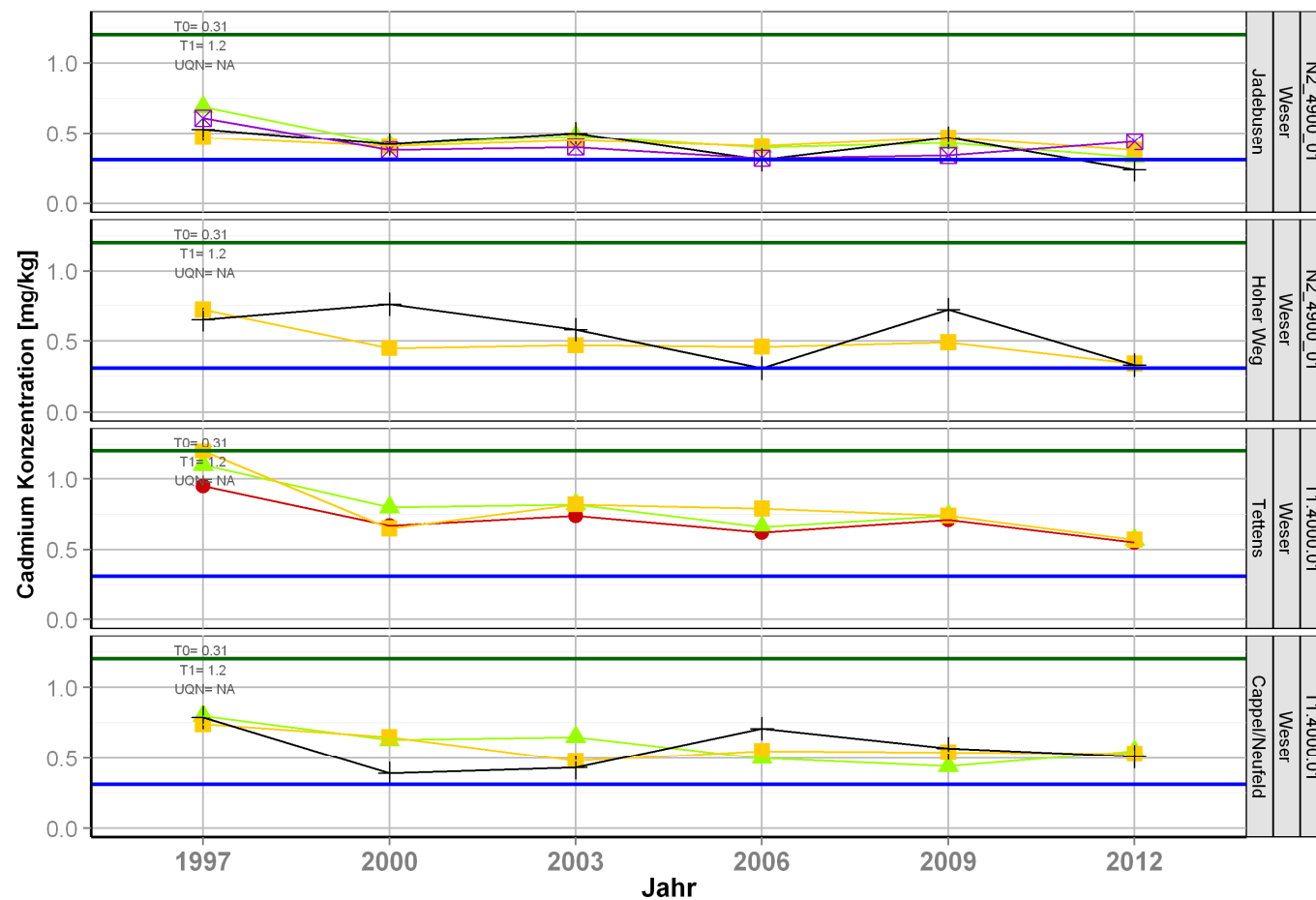
Grenzwerte: — OSPAR T0 - Wert — OSPAR T1 - Wert — Umweltqualitätsnorm (UQN)





Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	↓
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	↓
Leyb_S_C	→
Spog_S_A	↓
Spog_S_C	→
Woge_S_A	→
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	→
Nney_S_D	→

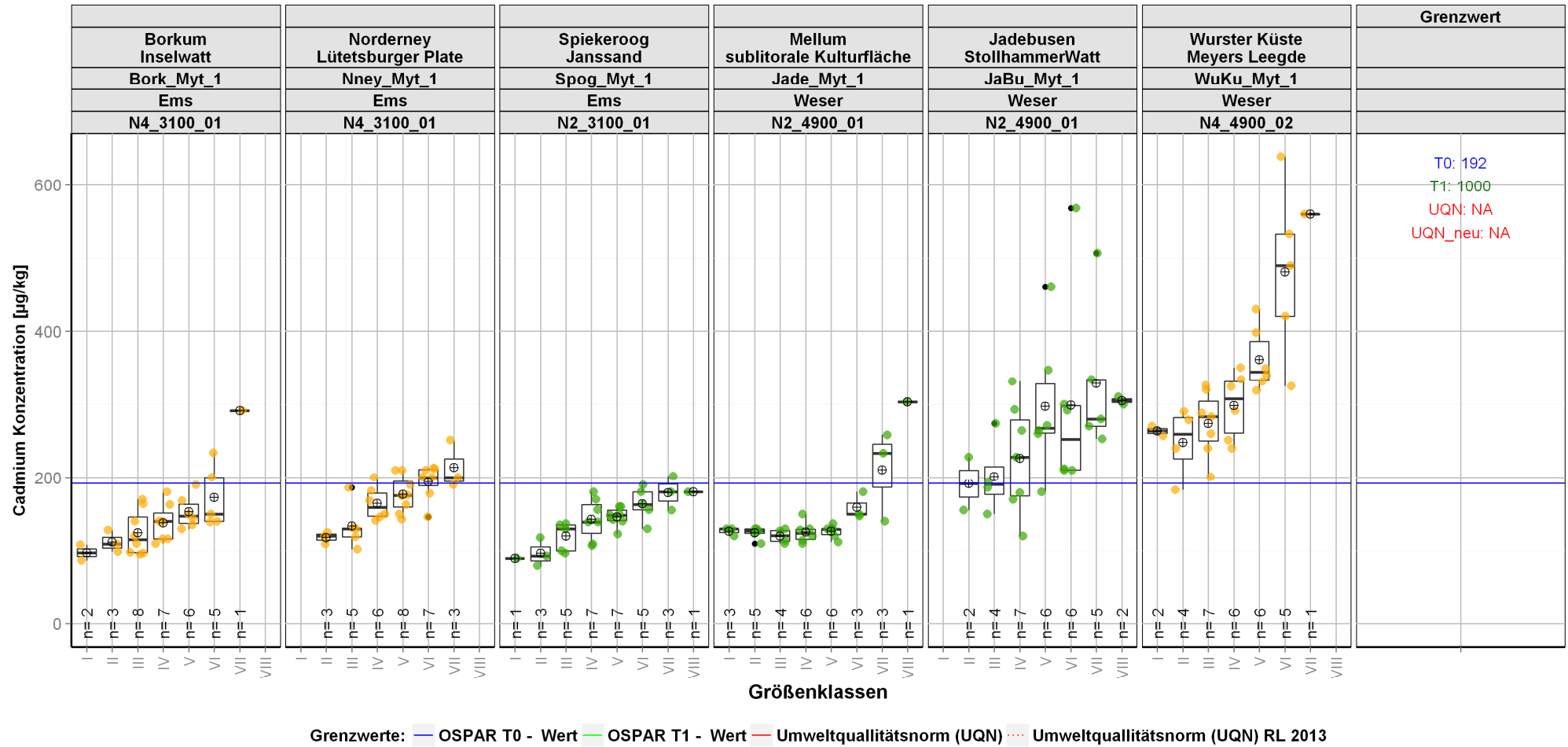


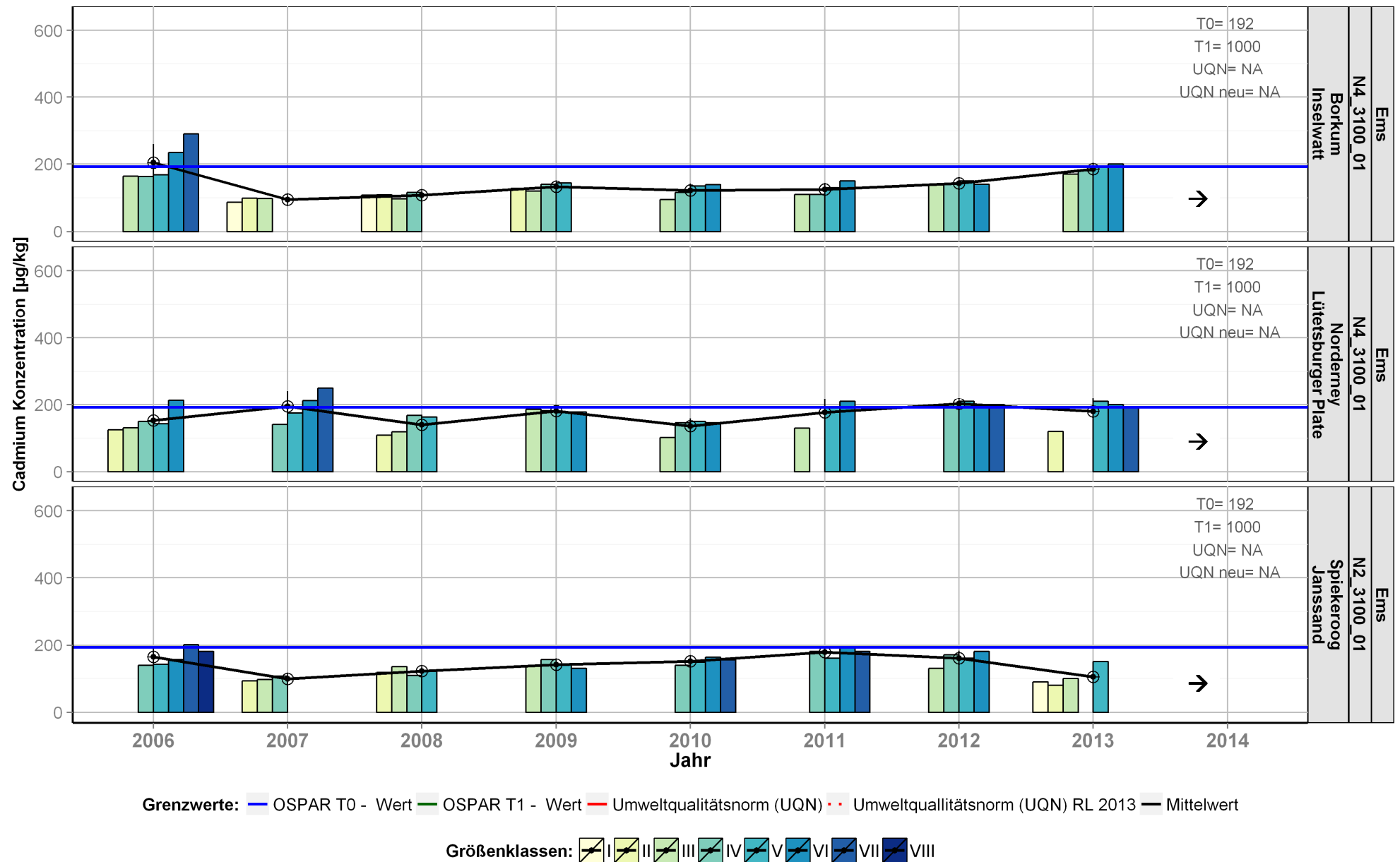


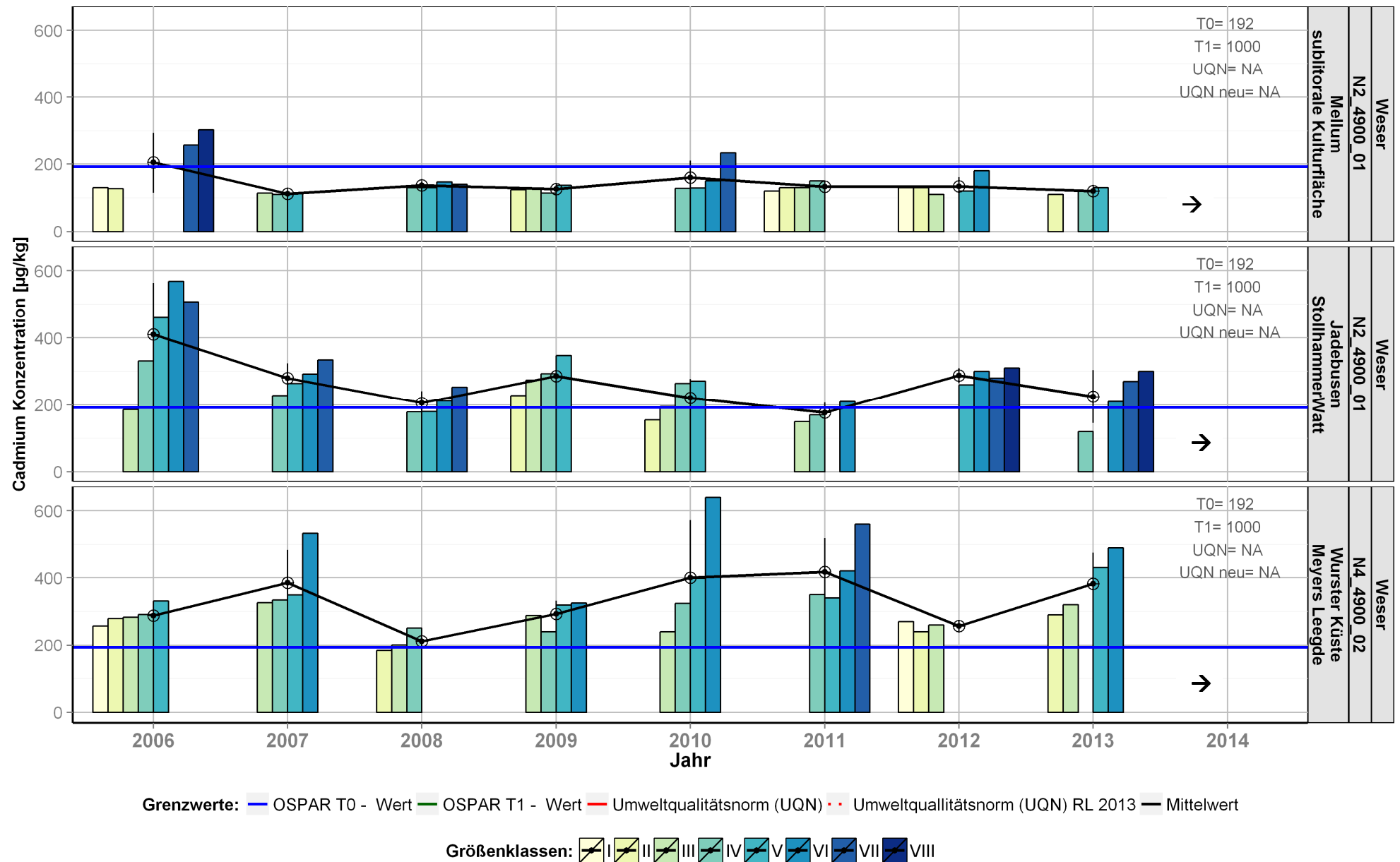
Station	Trend
Jabu_S_B	→
Jabu_S_C	→
Jabu_S_D	→
Jabu_S_E	→
Jade_S_C	→
Jade_S_D	→
WeMu_S_A	→
WeMu_S_B	↓
WeMu_S_C	→
WuKu_S_B	→
WuKu_S_C	→
WuKu_S_D	→

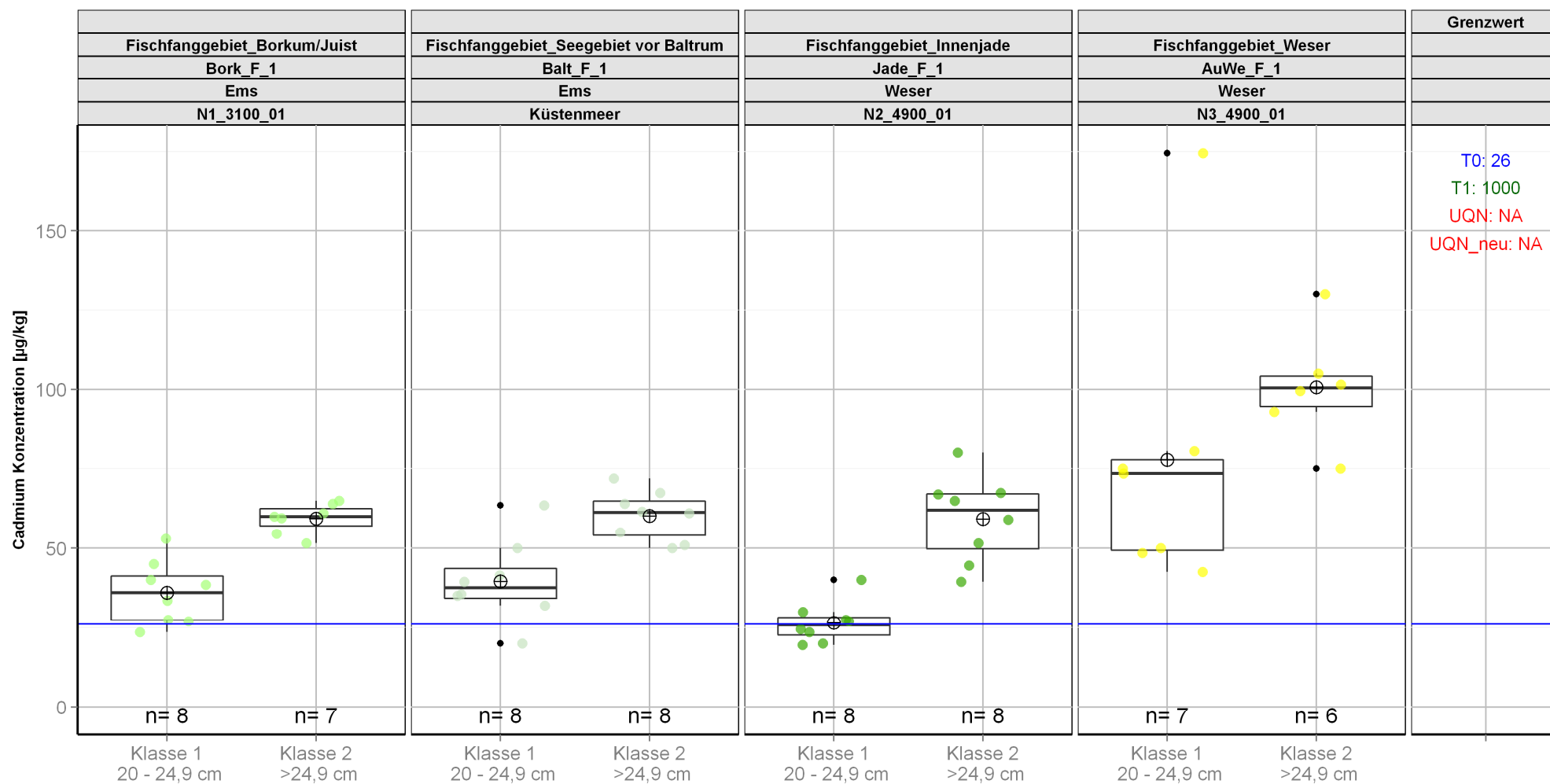


2.3 Biota



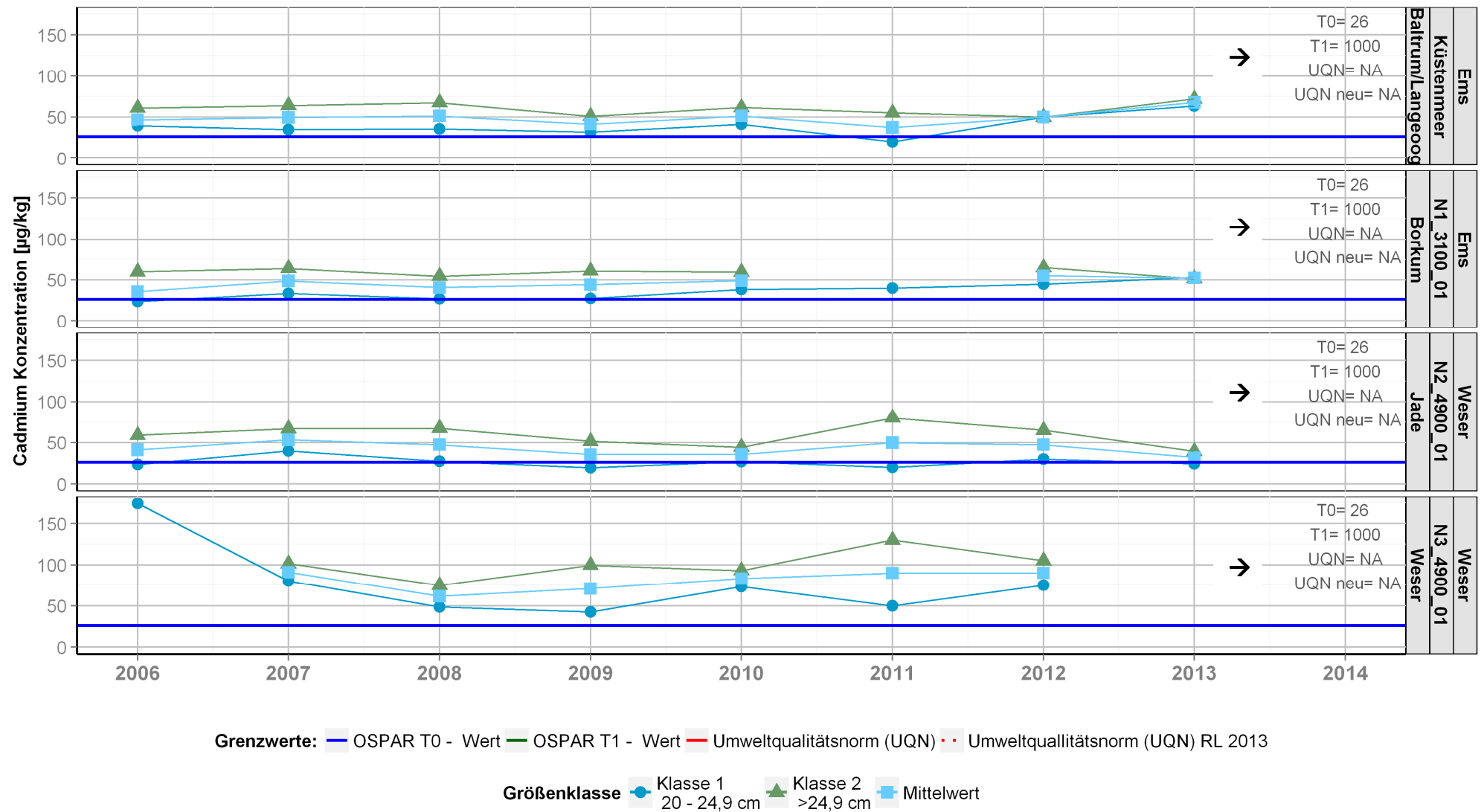






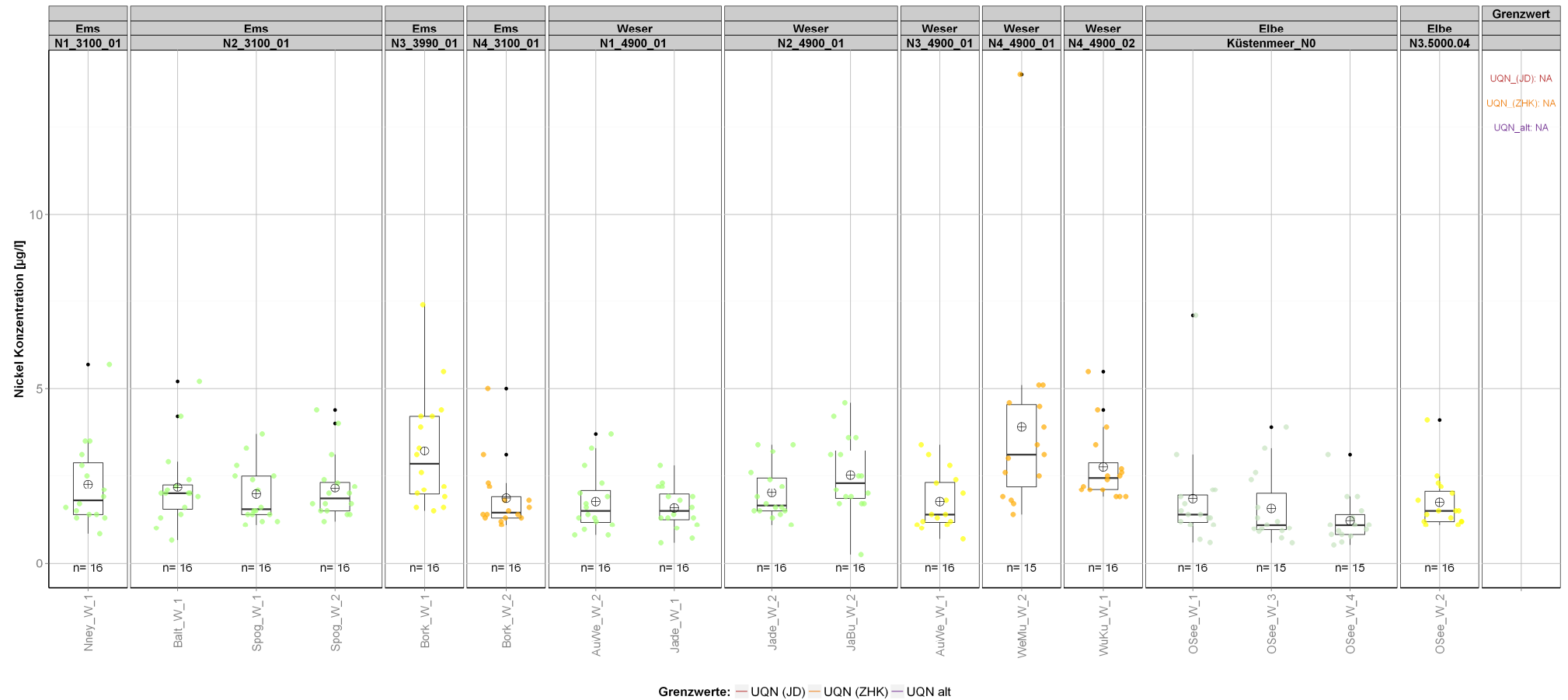
Grenzwerte: — OSPAR T0 - Wert — OSPAR T1 - Wert — Umweltqualitätsnorm (UQN) - - Umweltqualitätsnorm (UQN) RL 2013



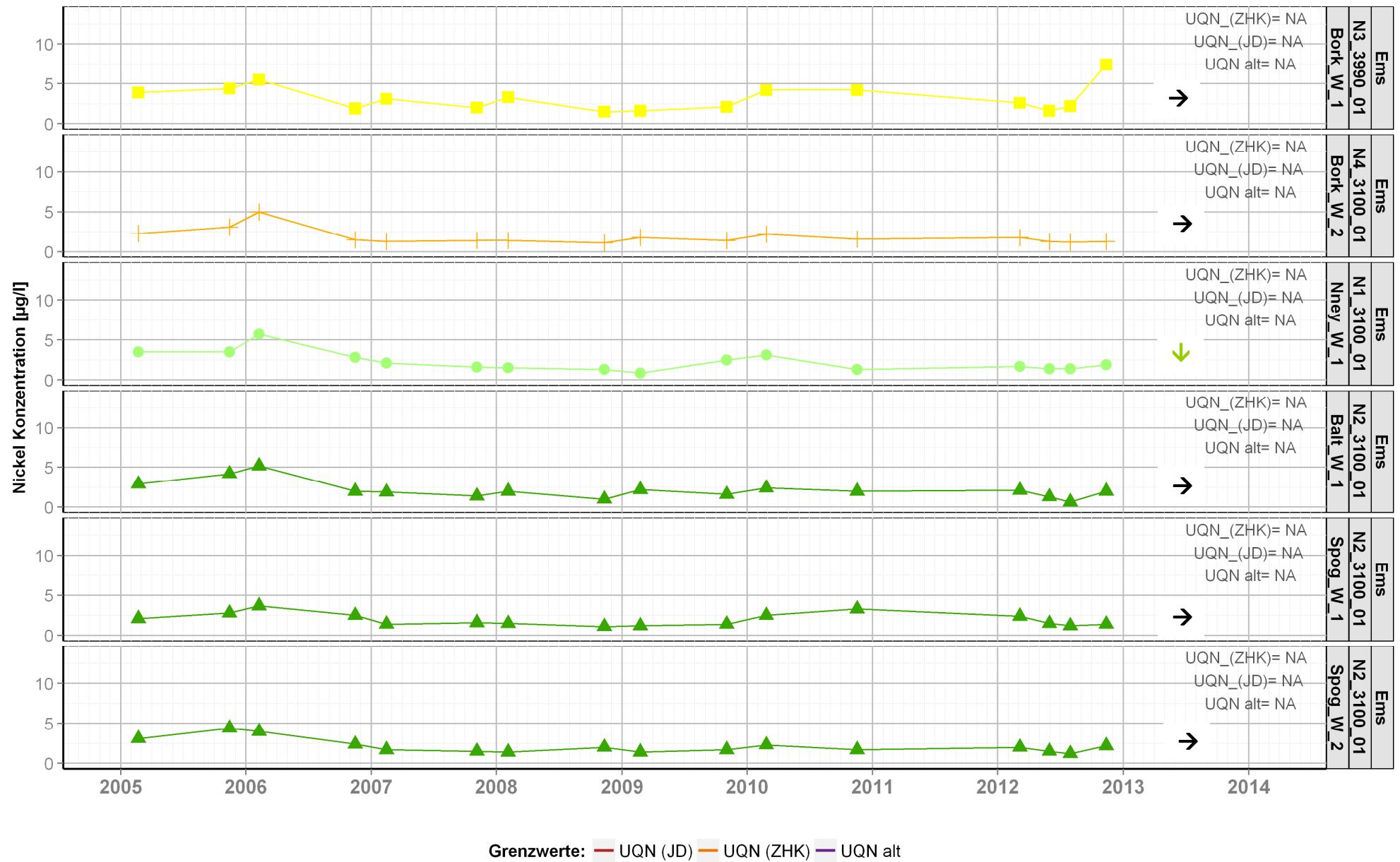


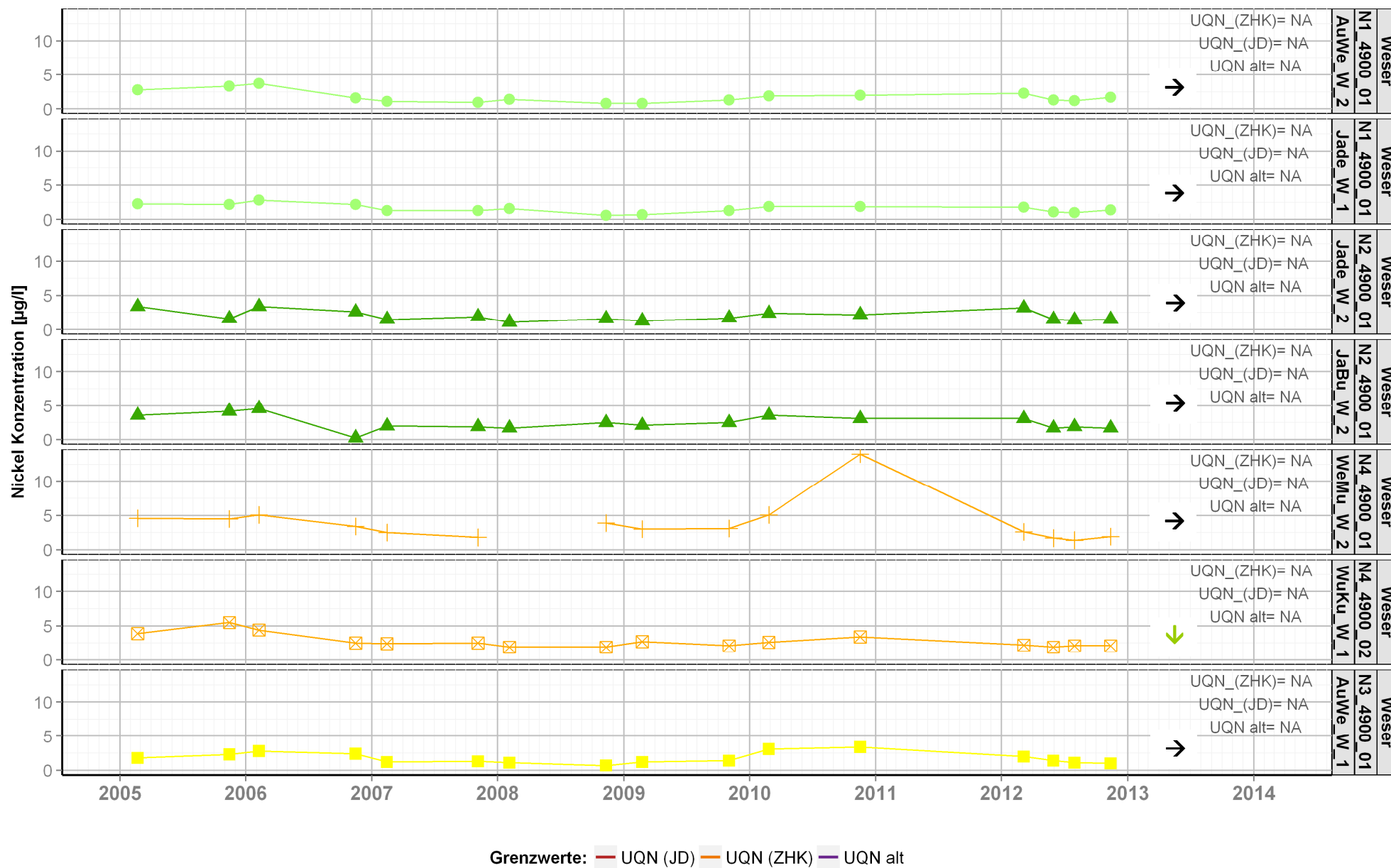
3. Nickel

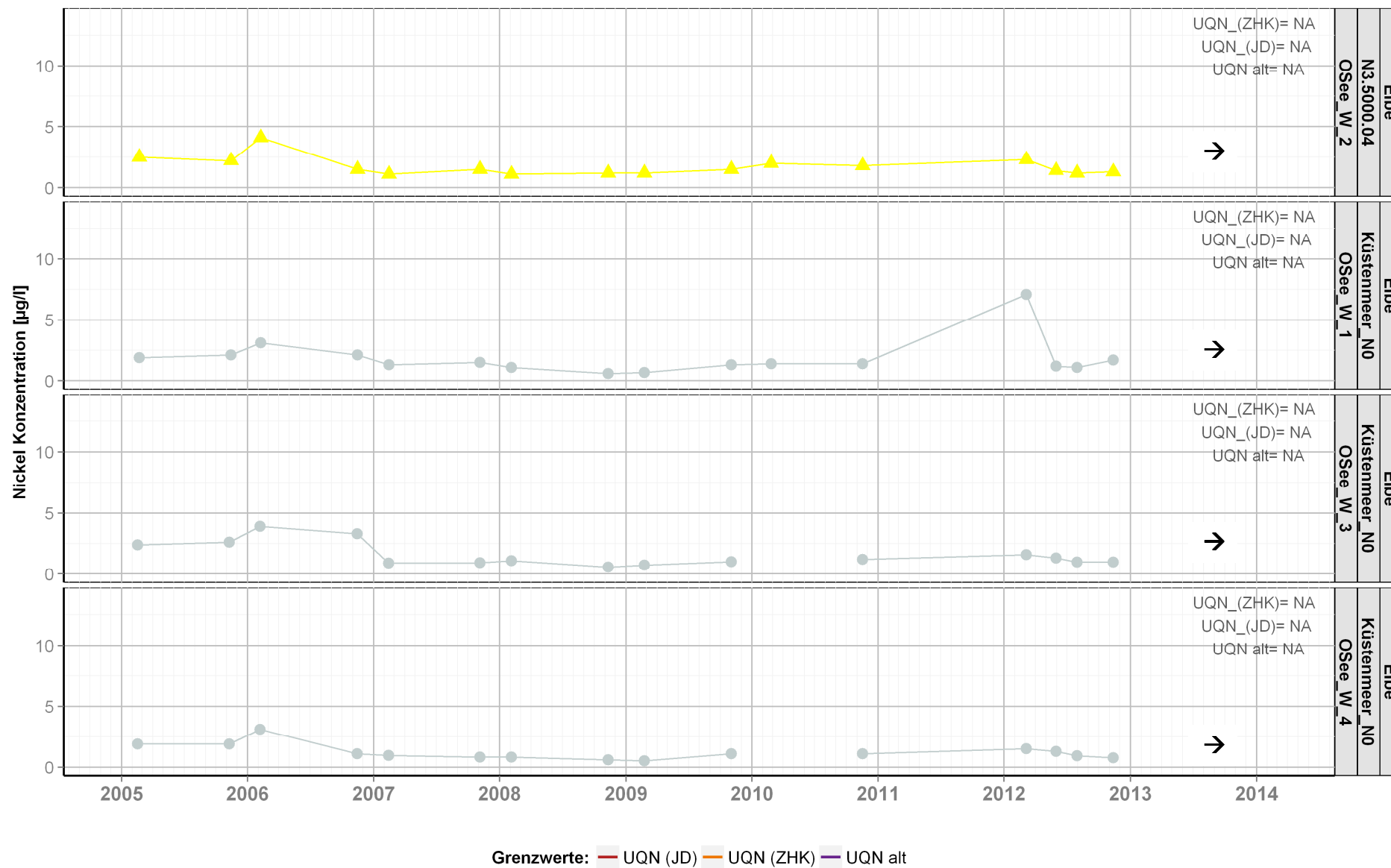
3.1 Wasser



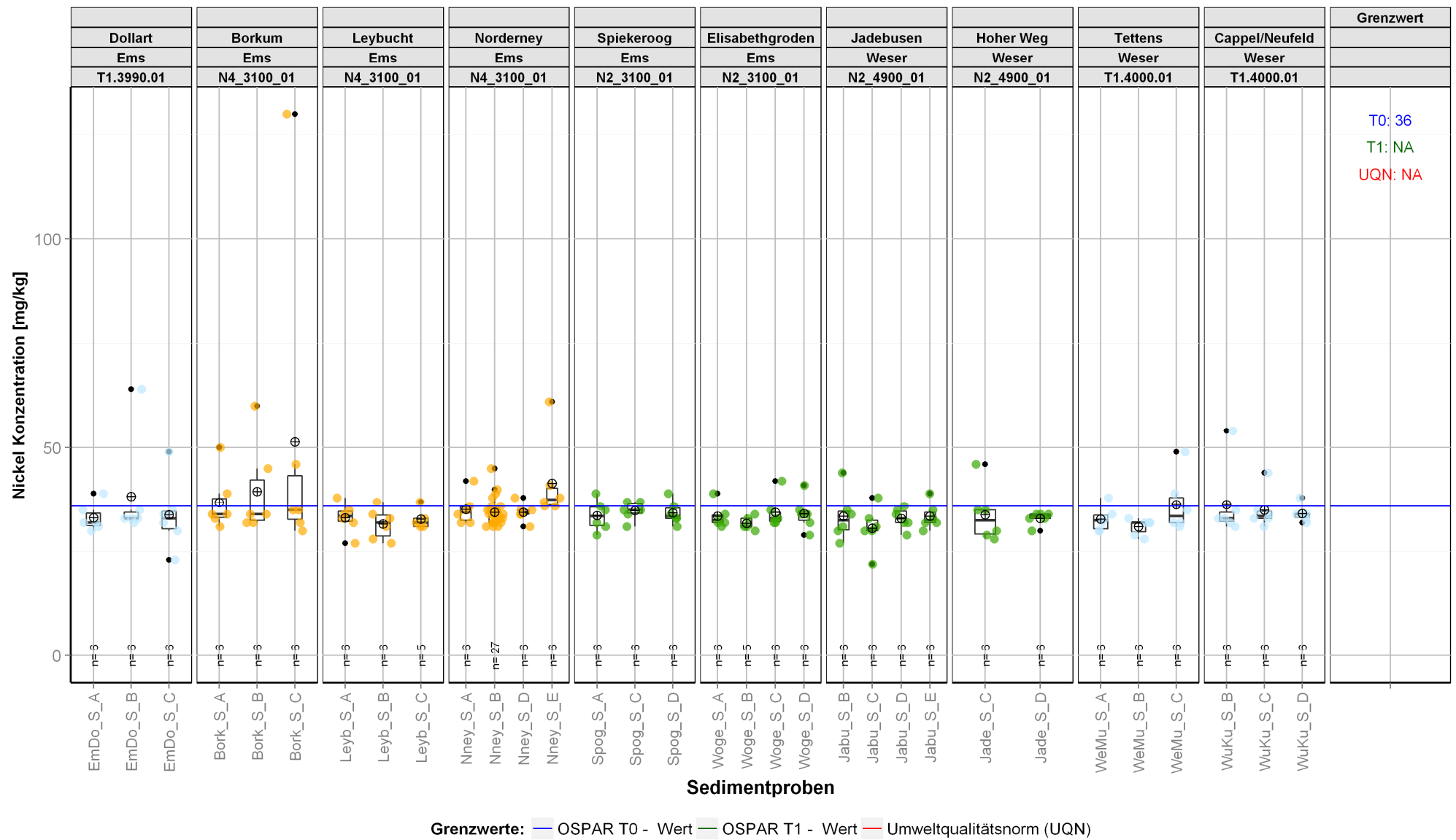
Bestimmungsgrenze: 0,5 $\mu\text{g/l}$

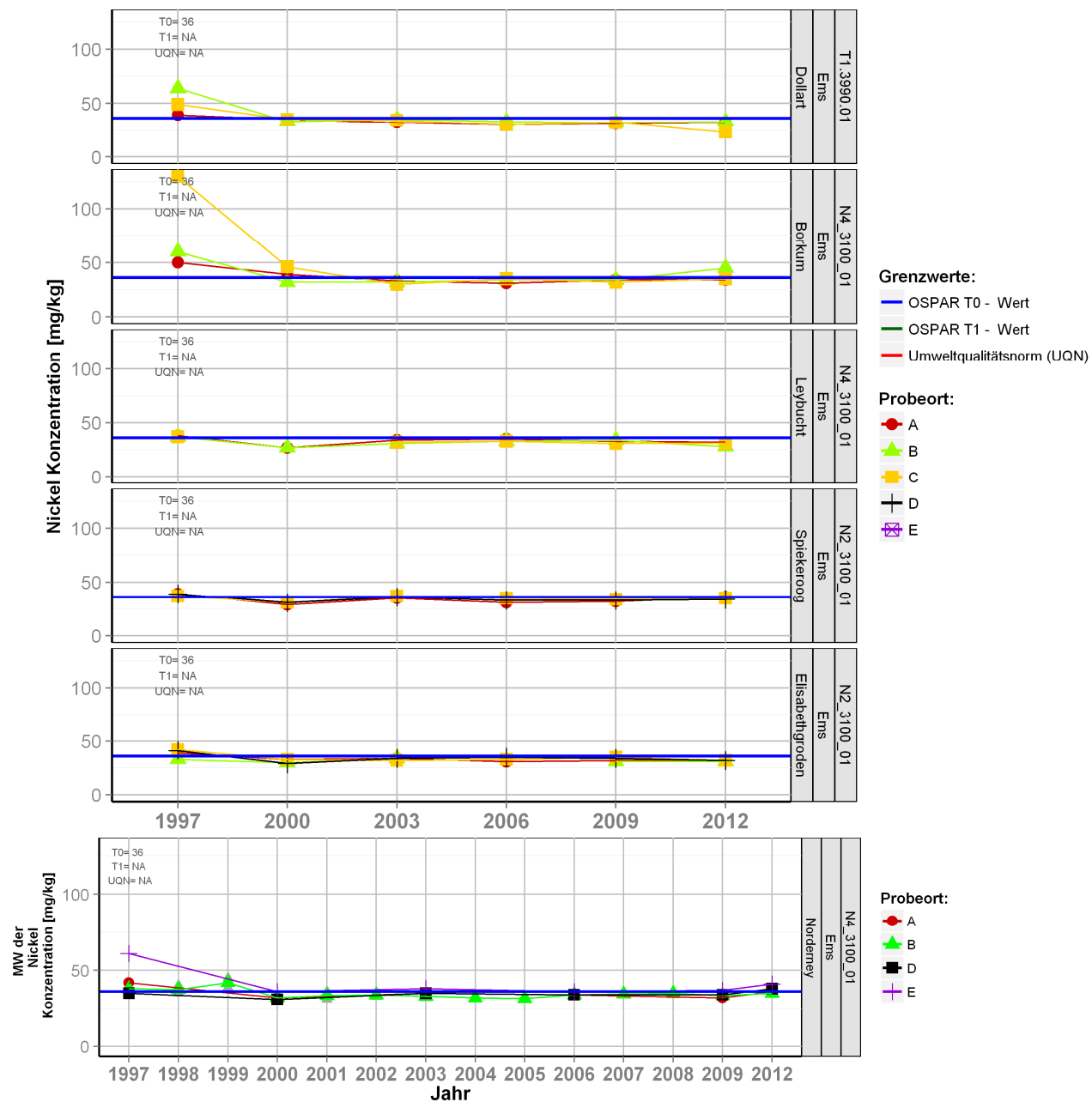






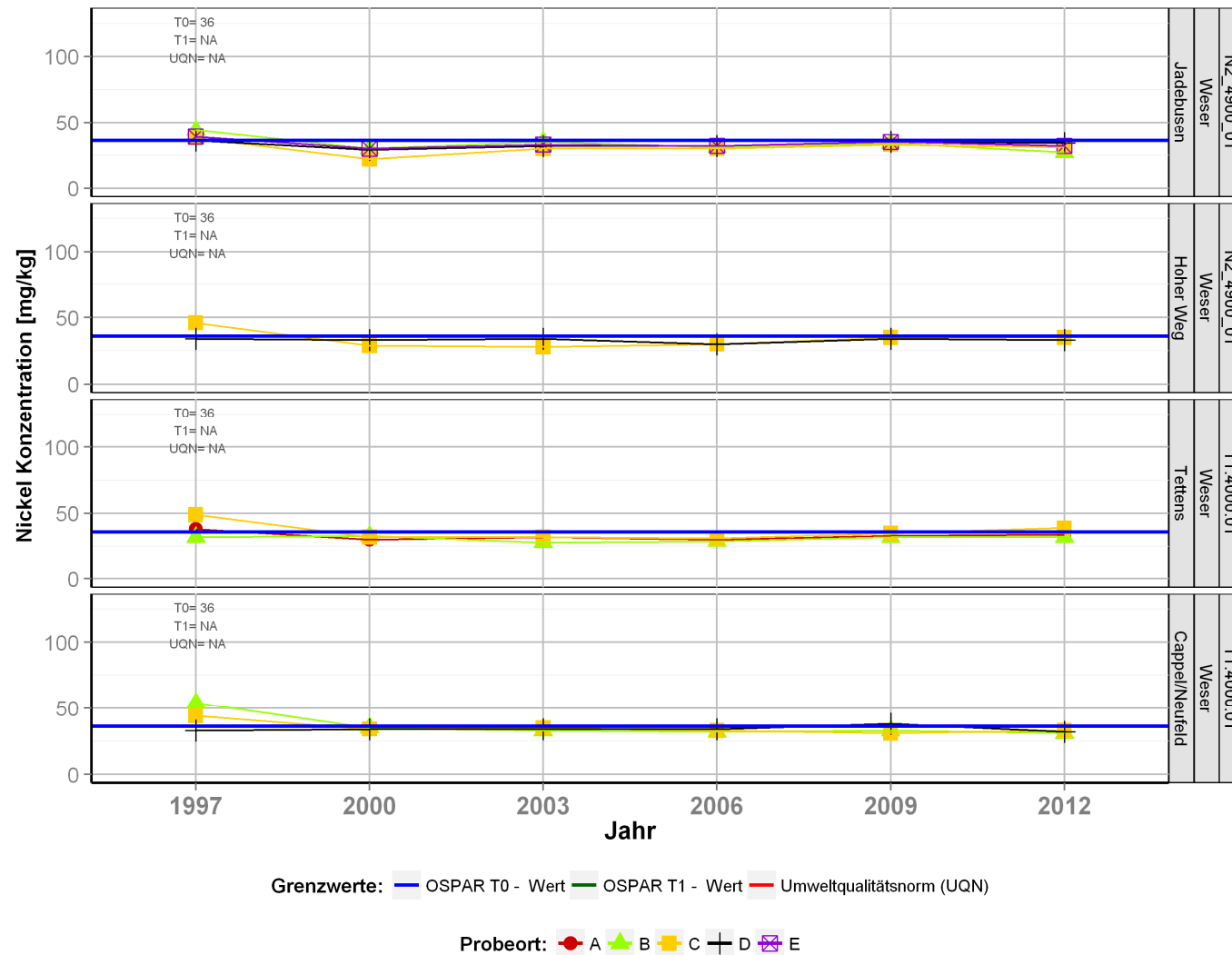
3.2 Sediment





Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	↓
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	→
Leyb_S_C	→
Spog_S_A	→
Spog_S_C	→
Woge_S_A	→
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	→
Nney_S_D	→



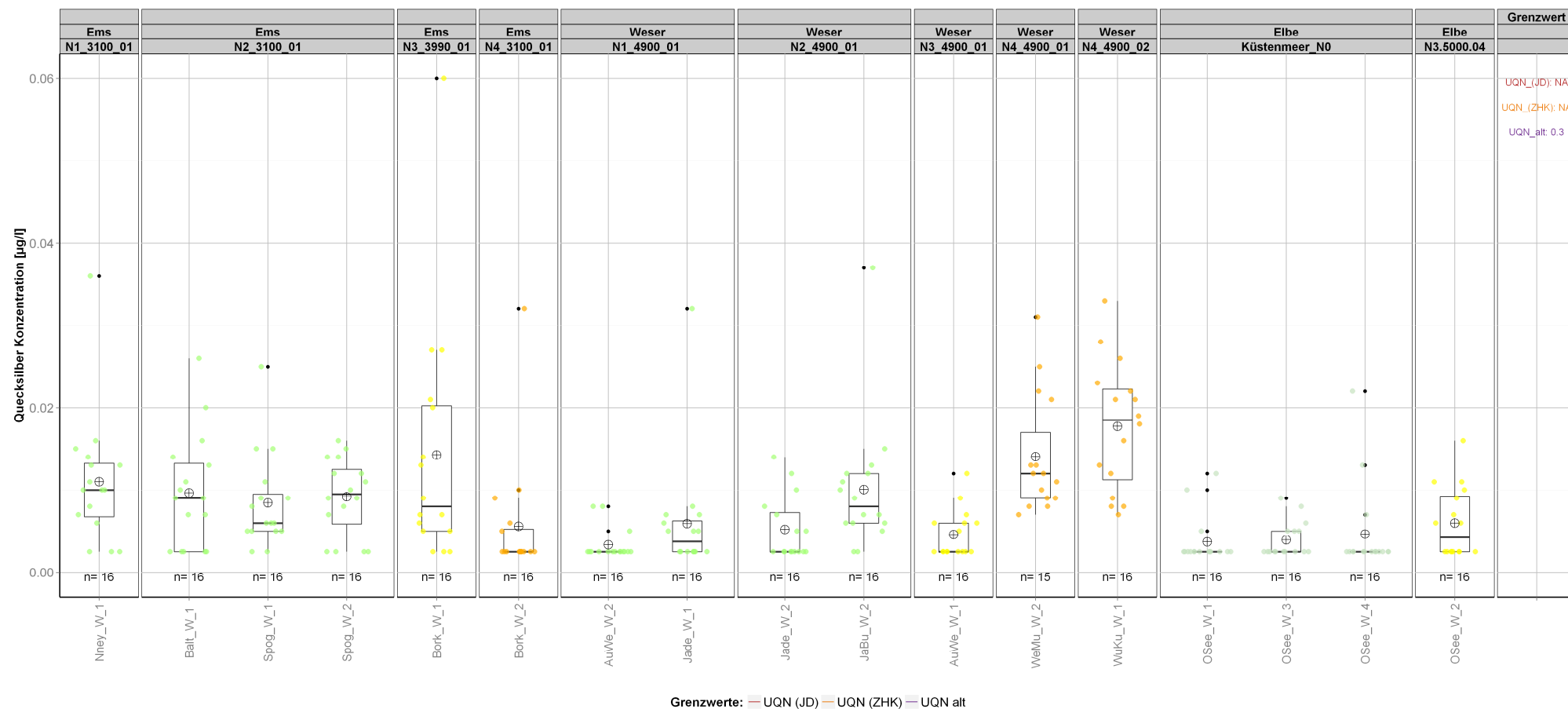


Station	Trend
Jabu_S_B	→
Jabu_S_C	→
Jabu_S_D	→
Jabu_S_E	→
Jade_S_C	→
Jade_S_D	→
WeMu_S_A	→
WeMu_S_B	→
WeMu_S_C	→
WuKu_S_B	↓
WuKu_S_C	→
WuKu_S_D	→

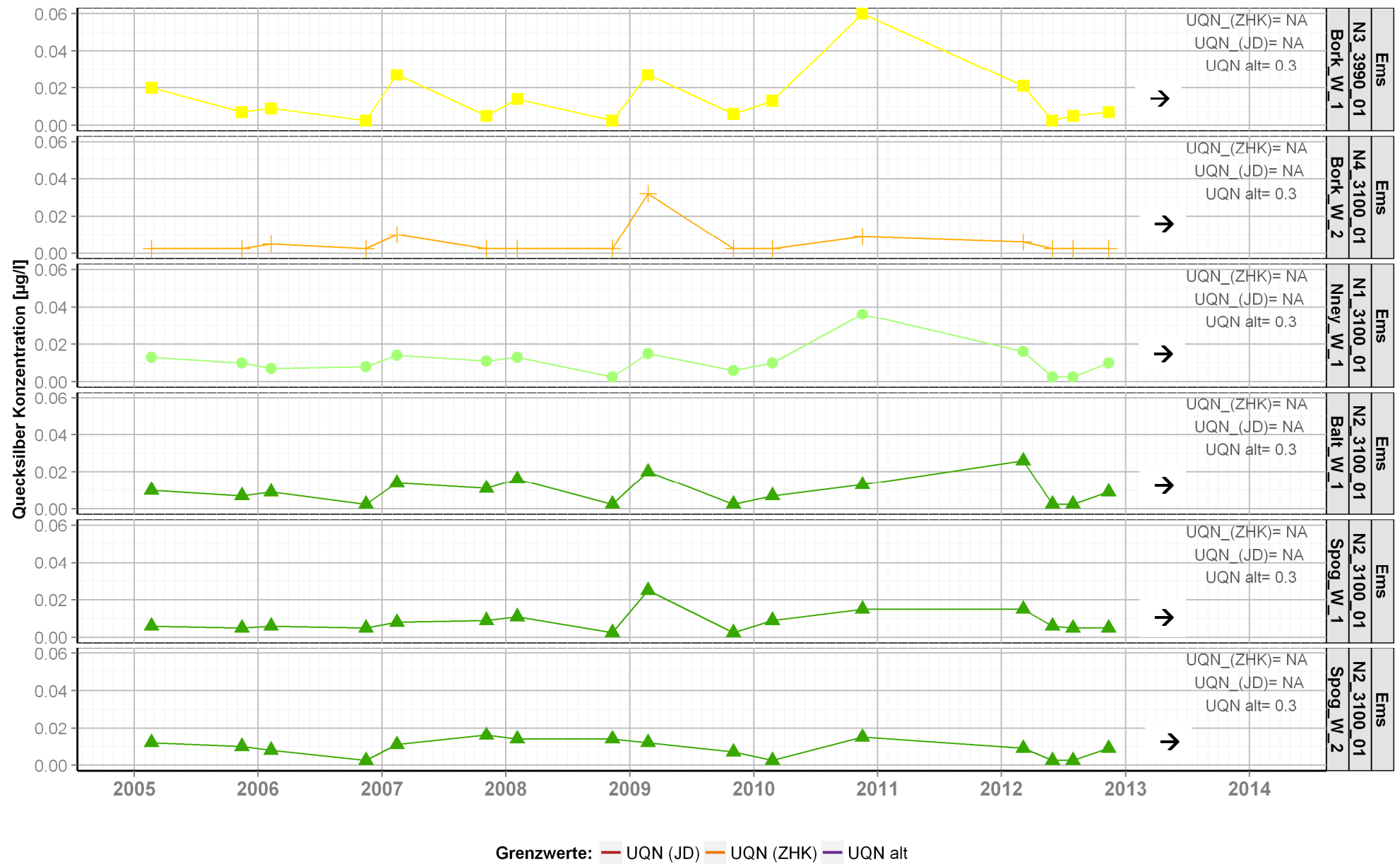


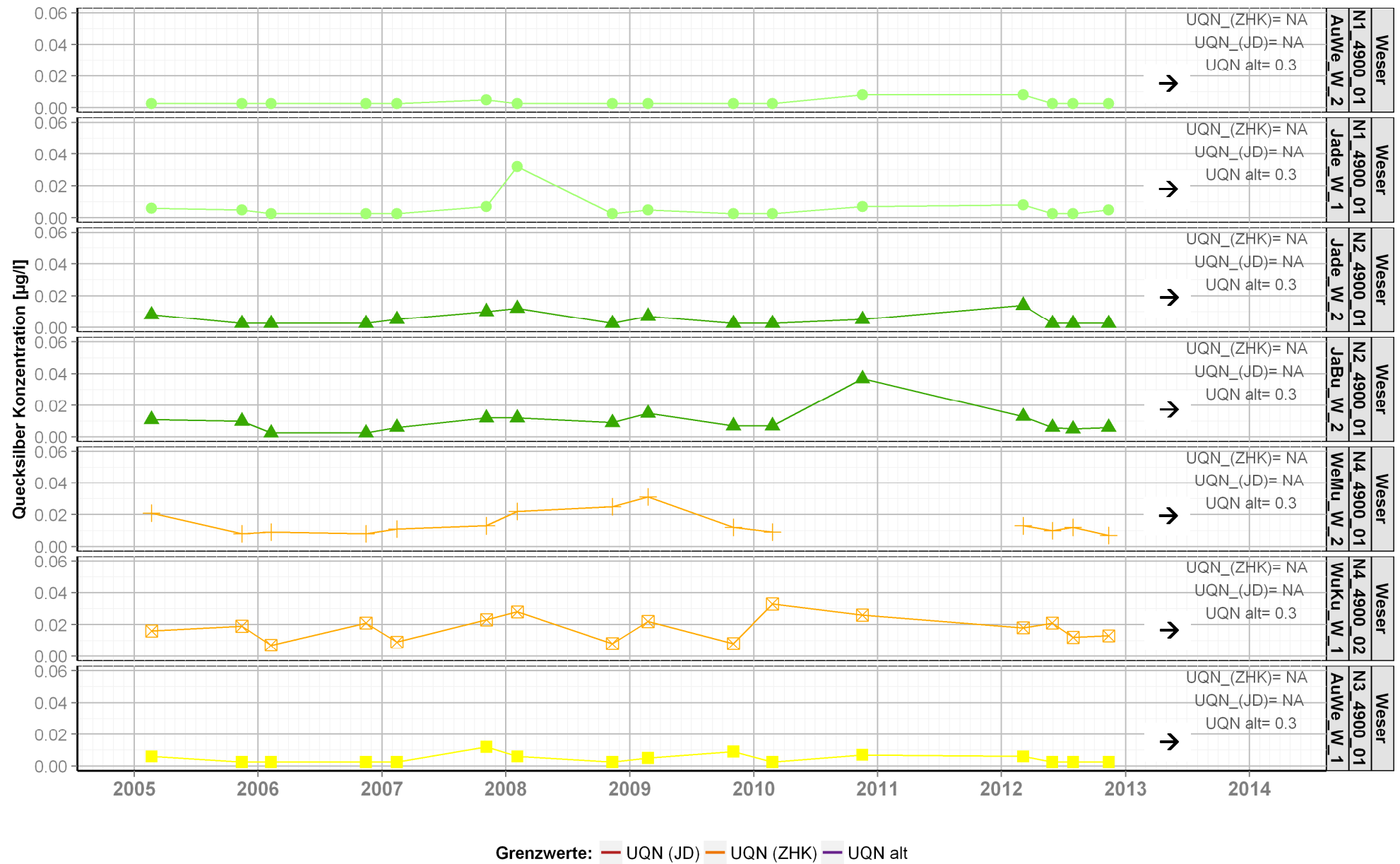
4. Quecksilber

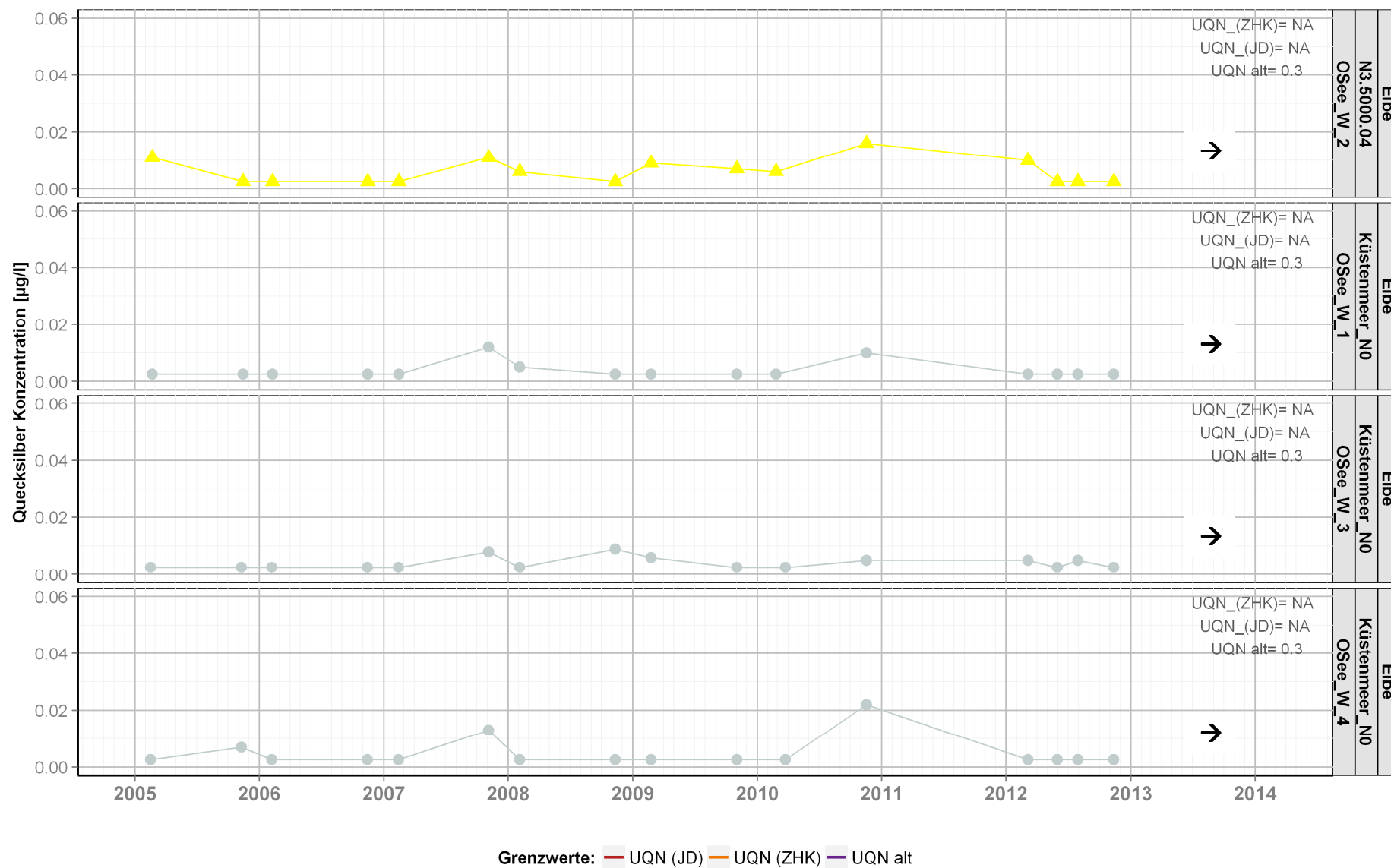
4.1 Wasser



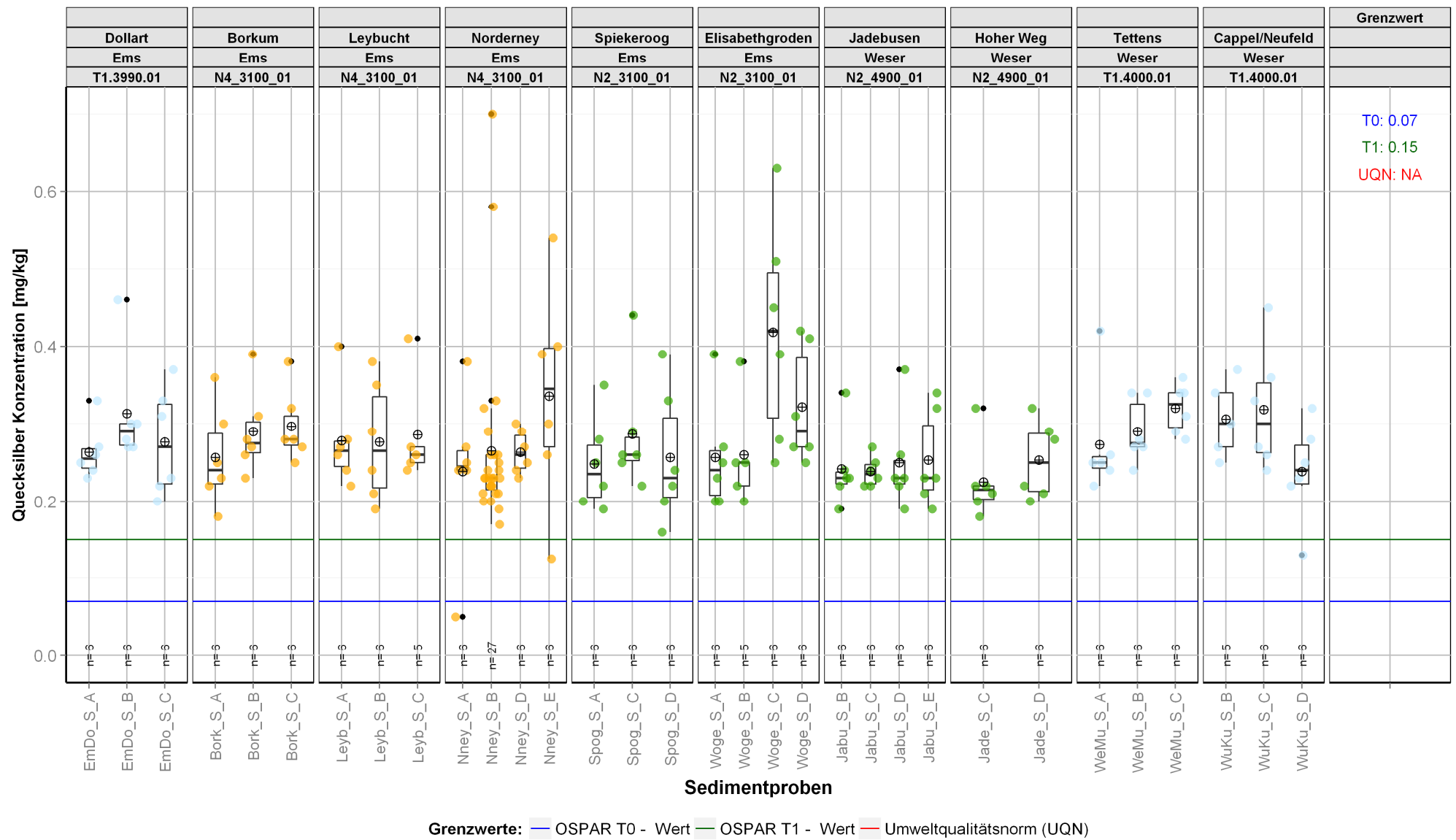
Bestimmungsgrenze: 0,005 µg/l

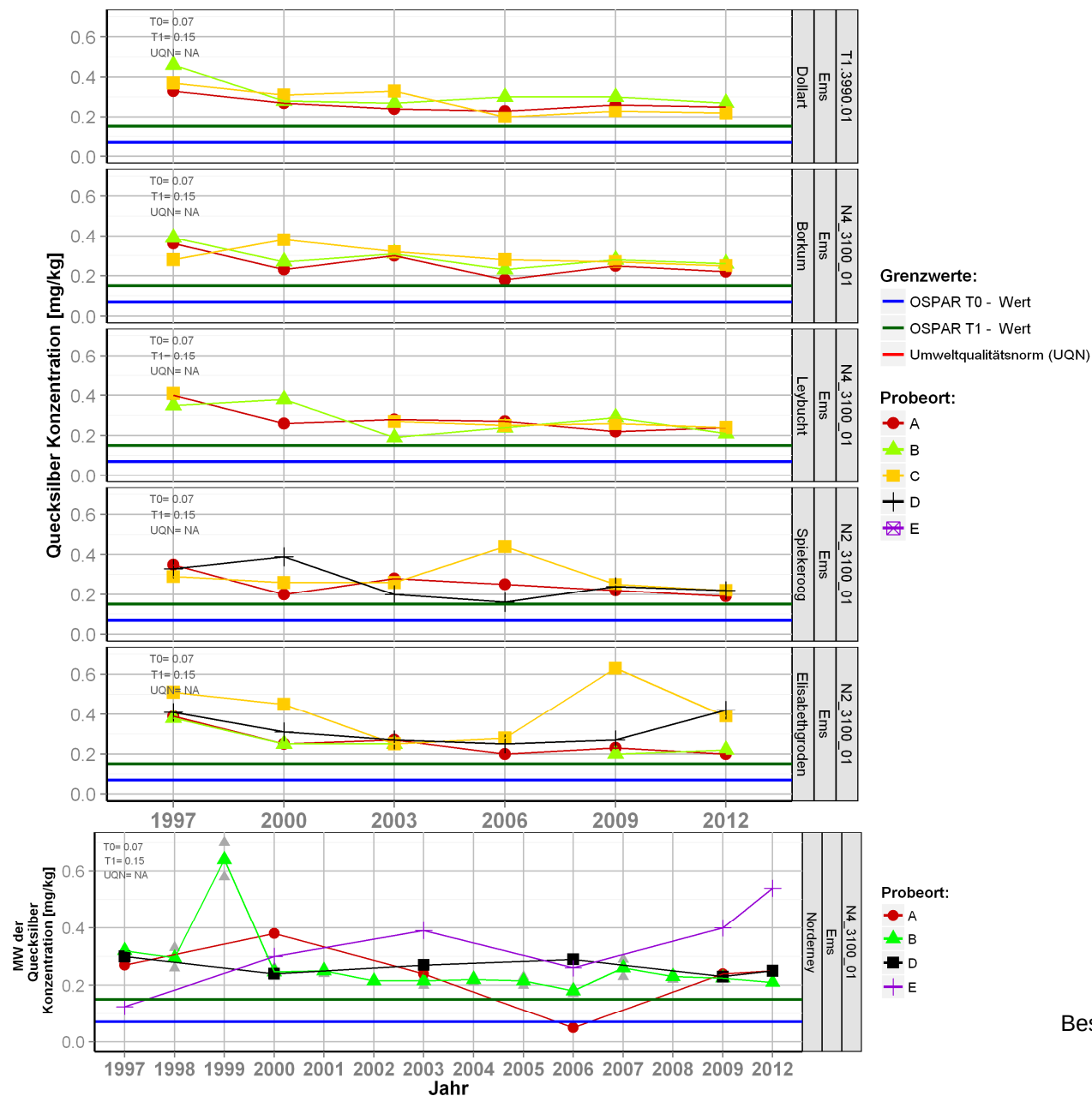






4.2 Sediment

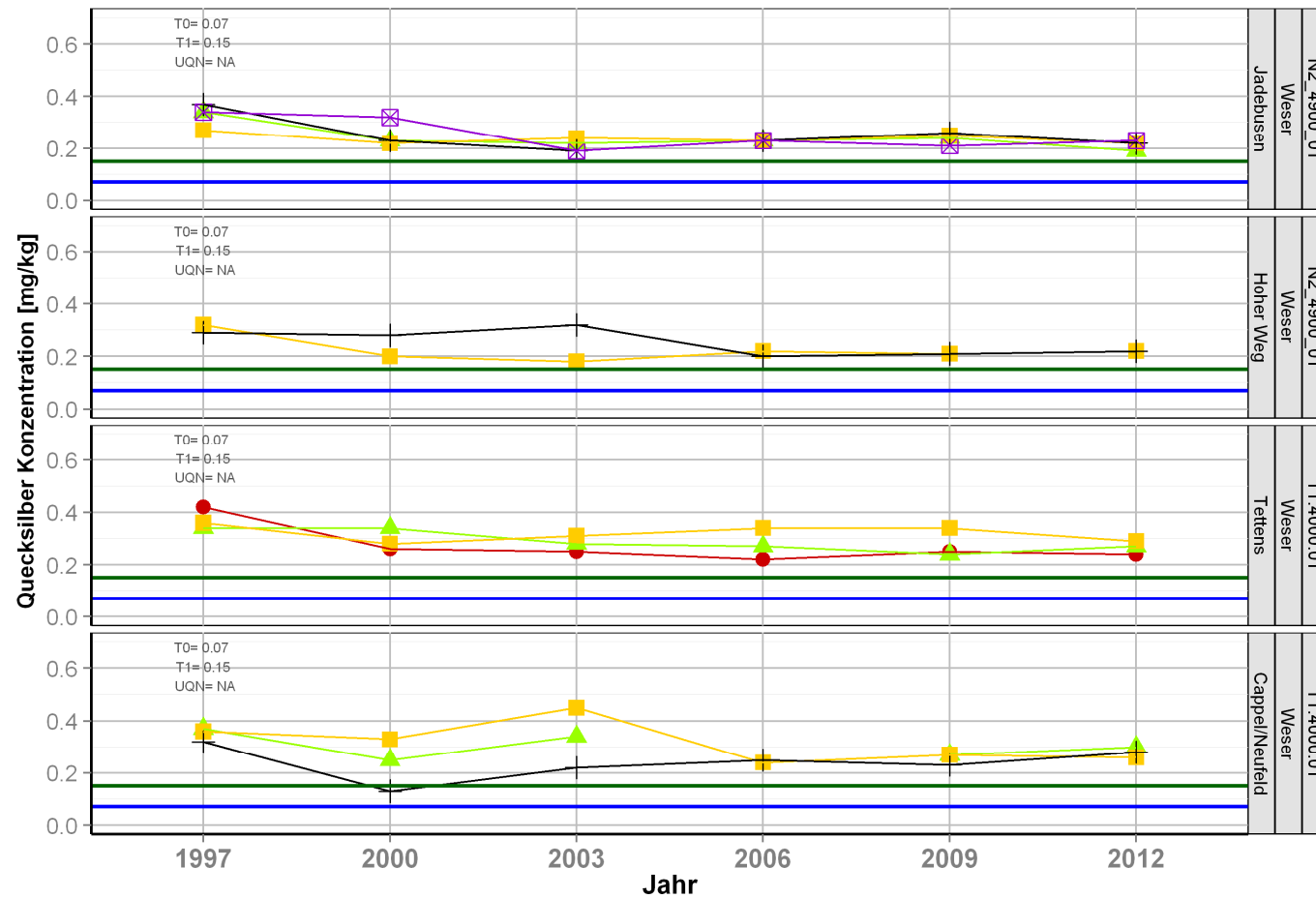




Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	→
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	→
Leyb_S_C	→
Spog_S_A	→
Spog_S_C	→
Woge_S_A	→
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	→
Nney_S_D	→

Bestimmungsgrenze 2006: 0,1 mg/kg

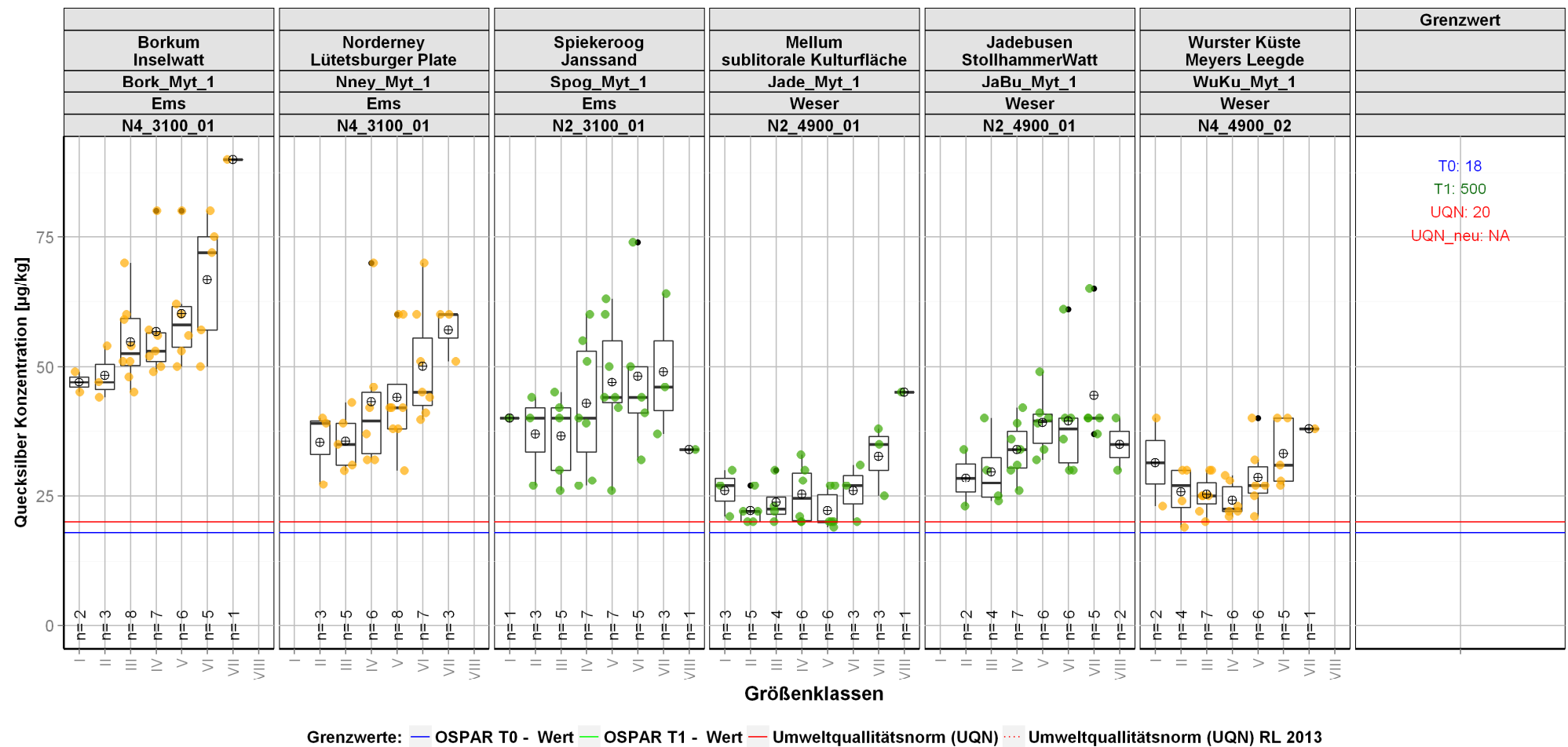


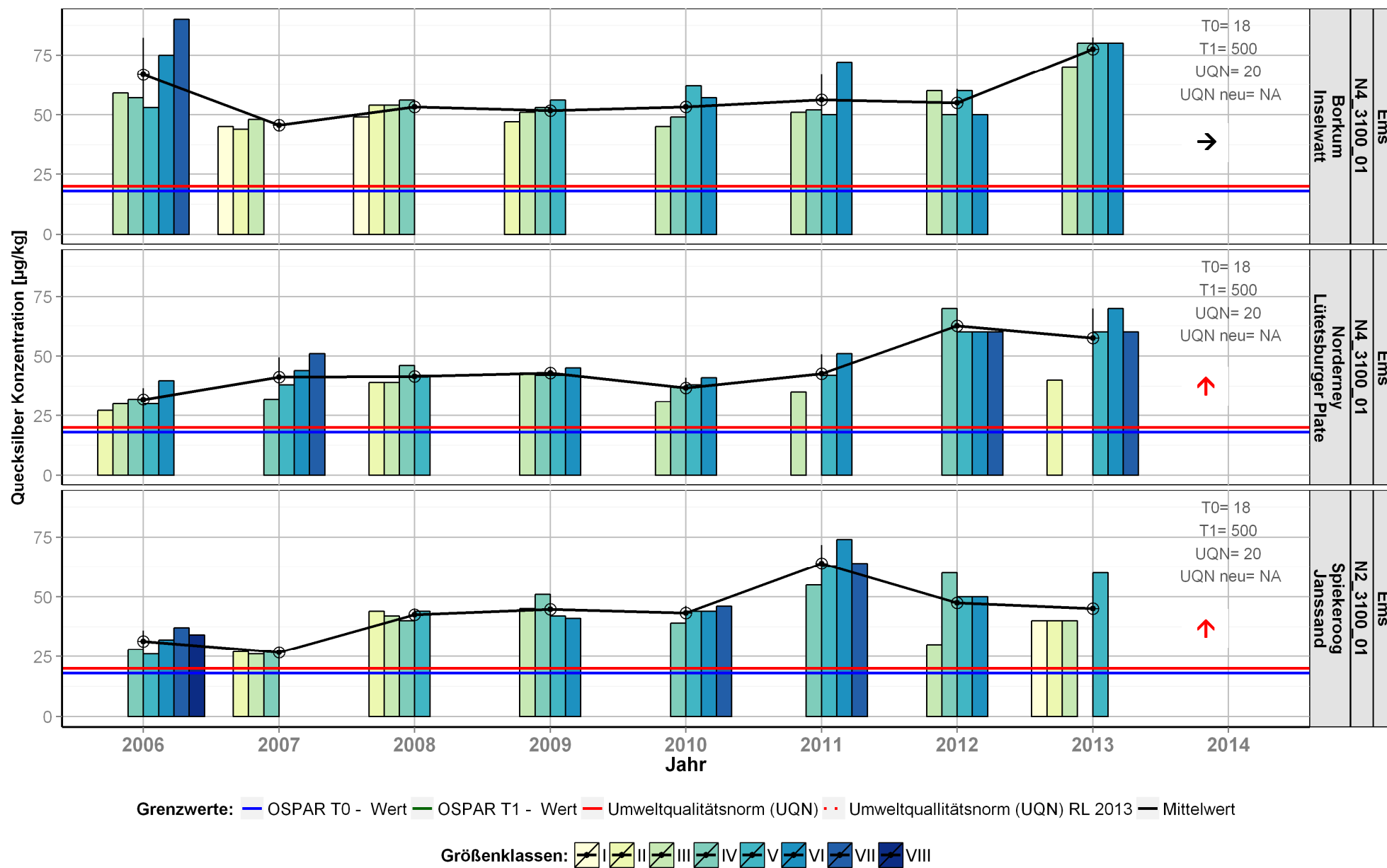


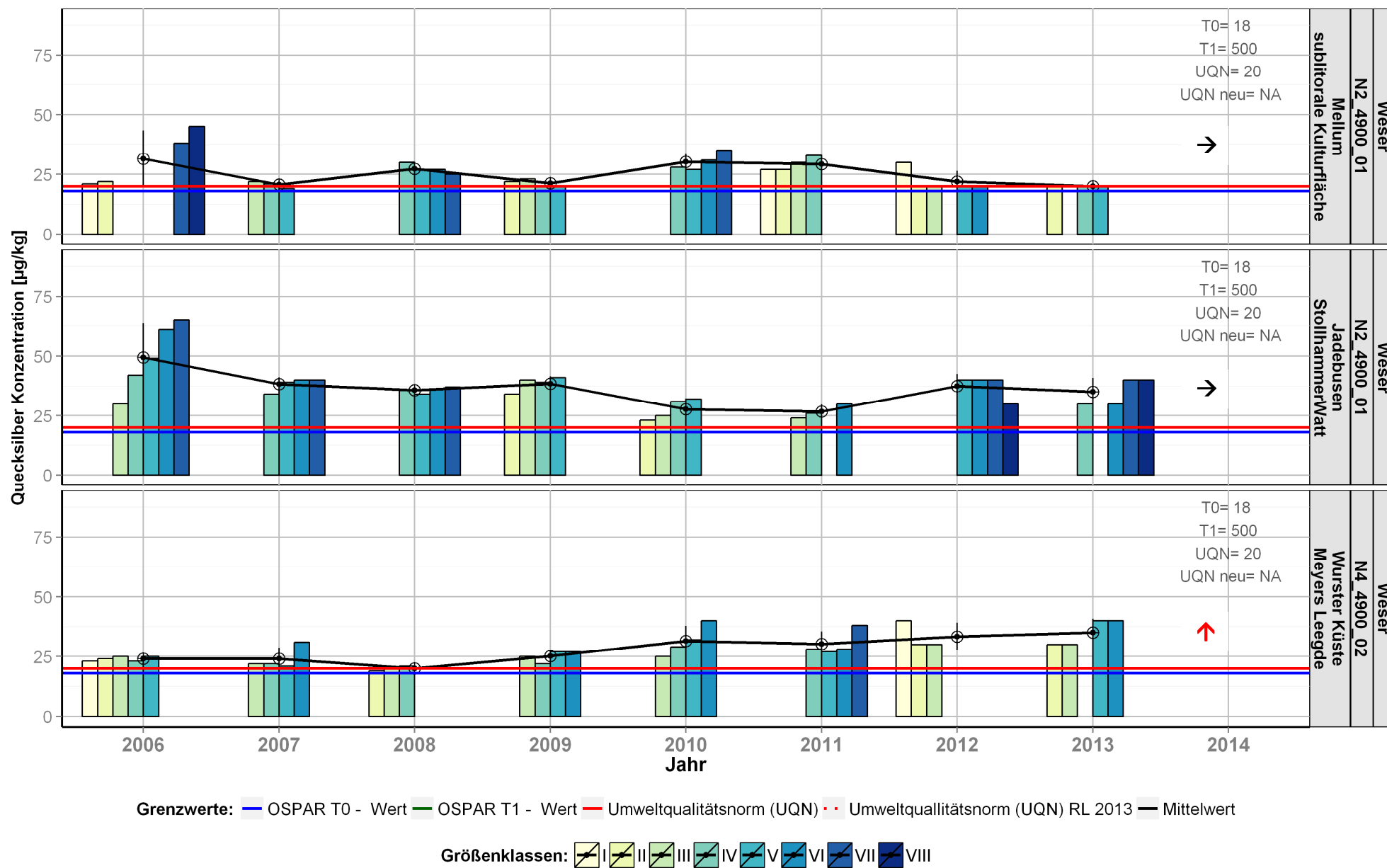
Station	Trend
Jabu_S_B	→
Jabu_S_C	→
Jabu_S_D	→
Jabu_S_E	→
Jade_S_C	→
Jade_S_D	→
WeMu_S_A	→
WeMu_S_B	↓
WeMu_S_C	→
WuKu_S_B	→
WuKu_S_C	→
WuKu_S_D	→

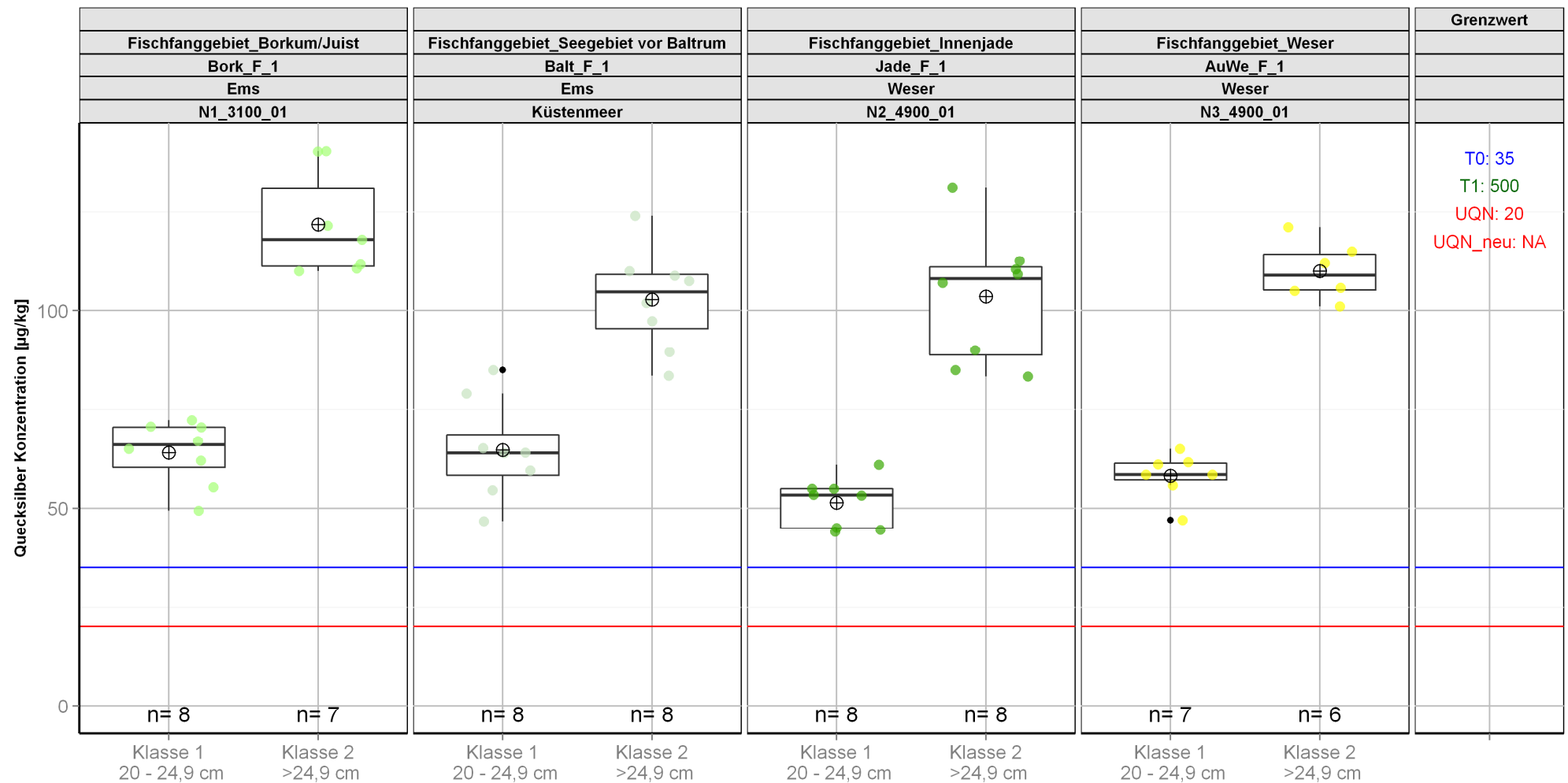


4.3 Biota

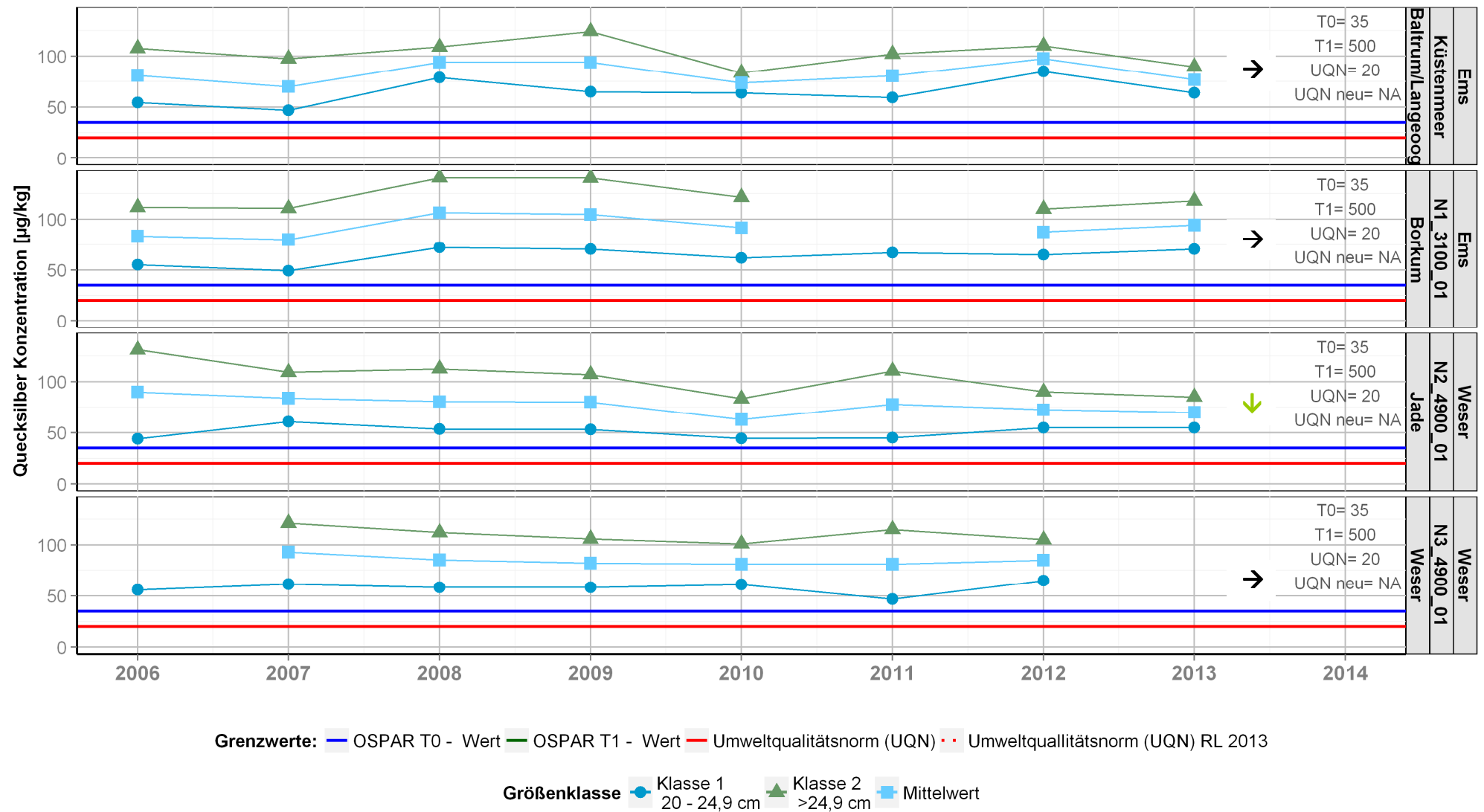






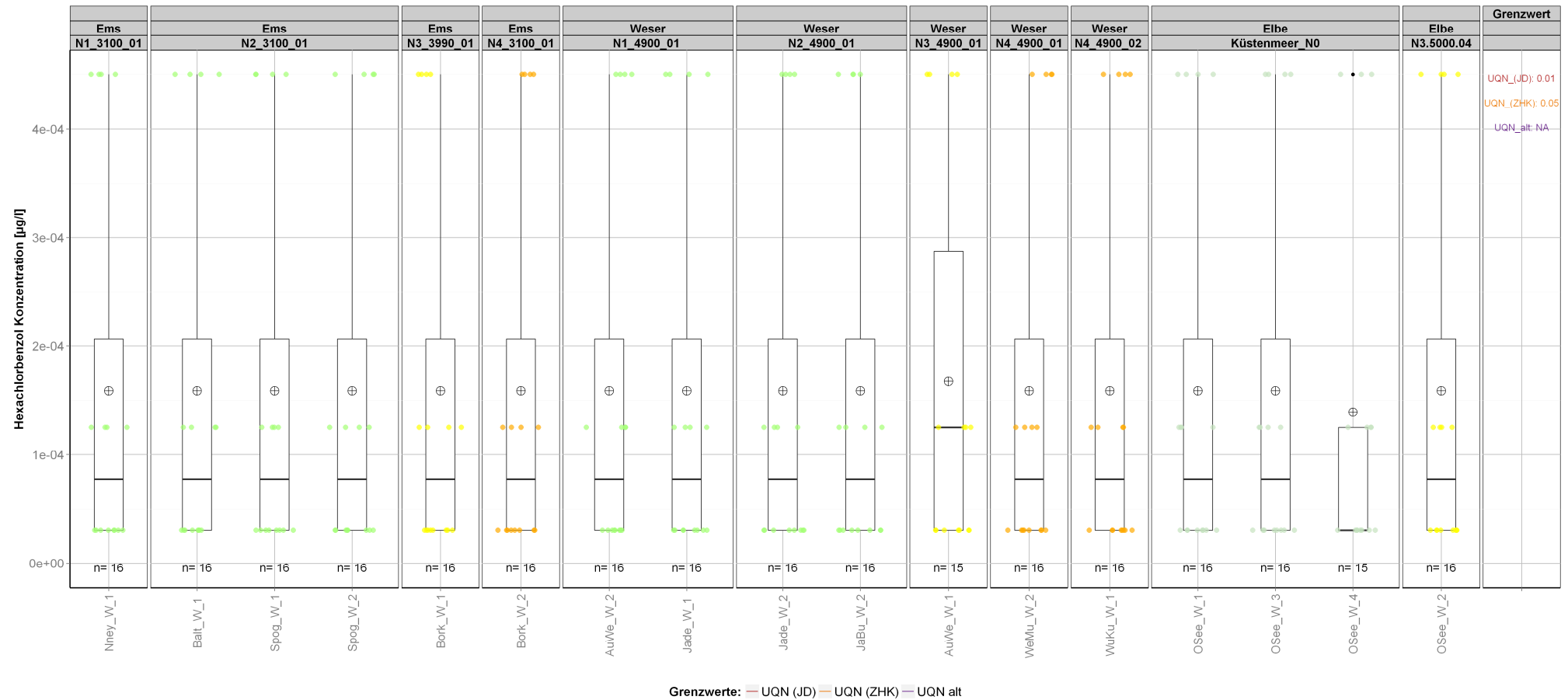


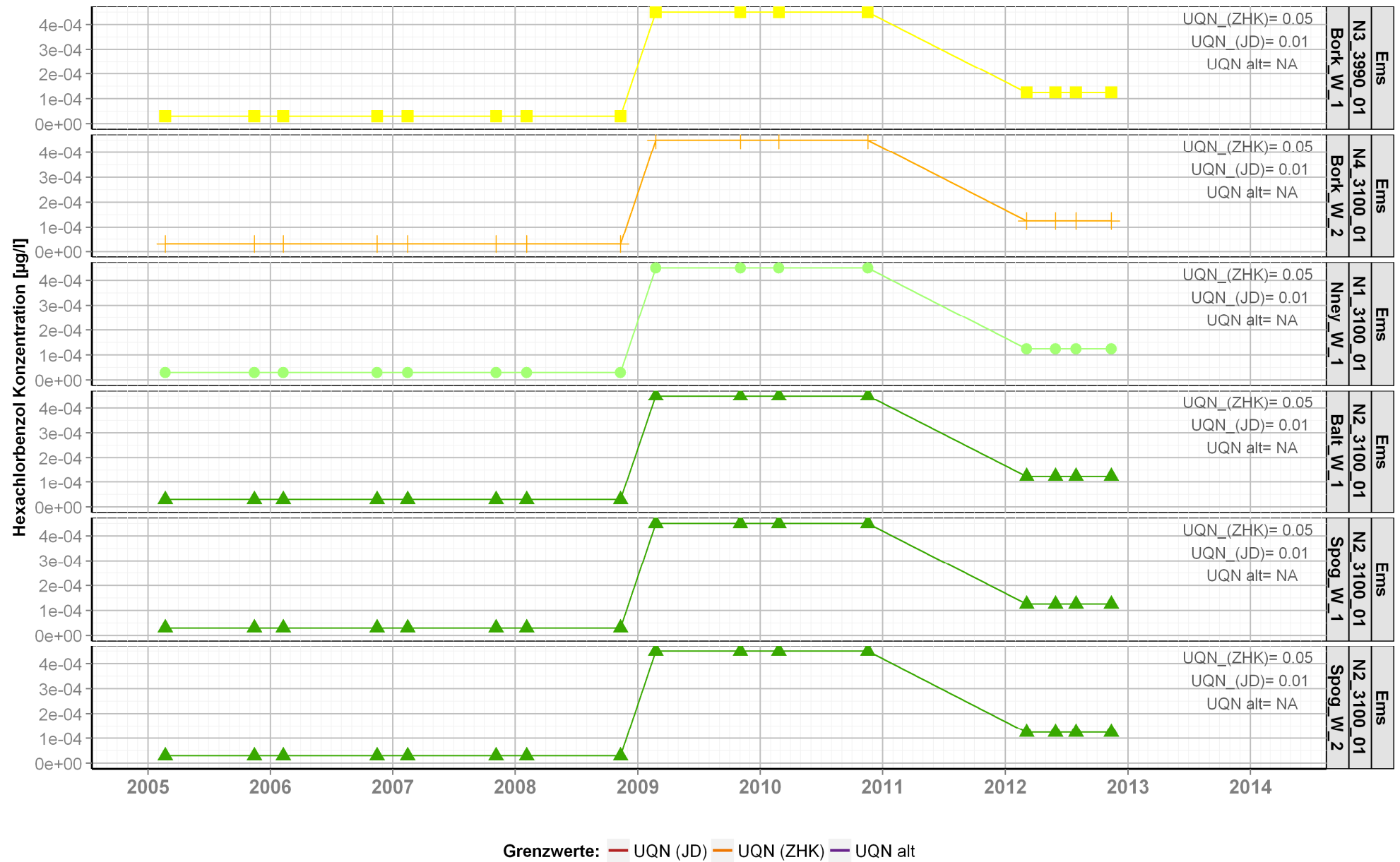
Grenzwerte: — OSPAR T0 - Wert — OSPAR T1 - Wert — Umweltqualitätsnorm (UQN) - - Umweltqualitätsnorm (UQN) RL 2013



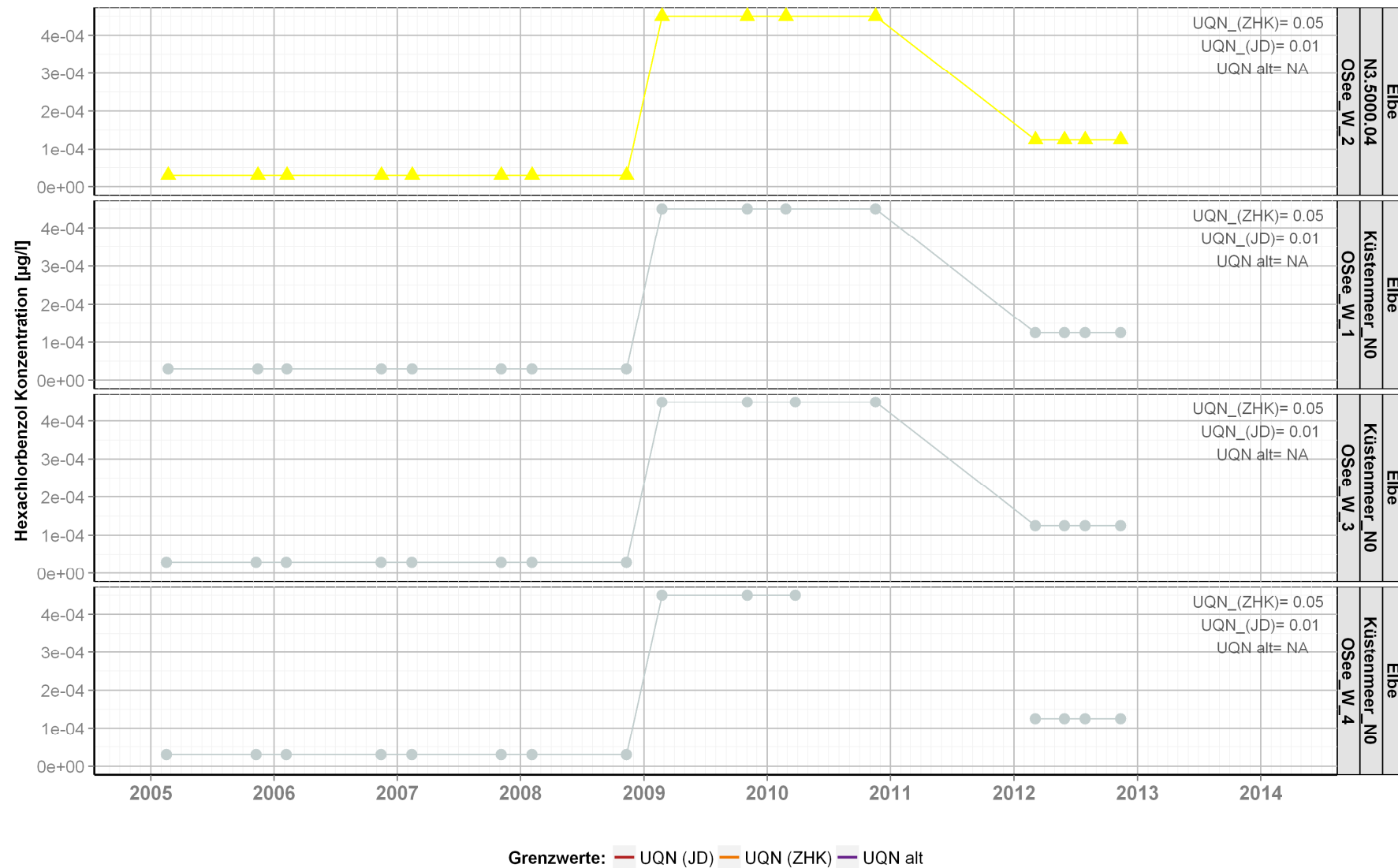
5. Hexachlorbenzol

5.1 Wasser

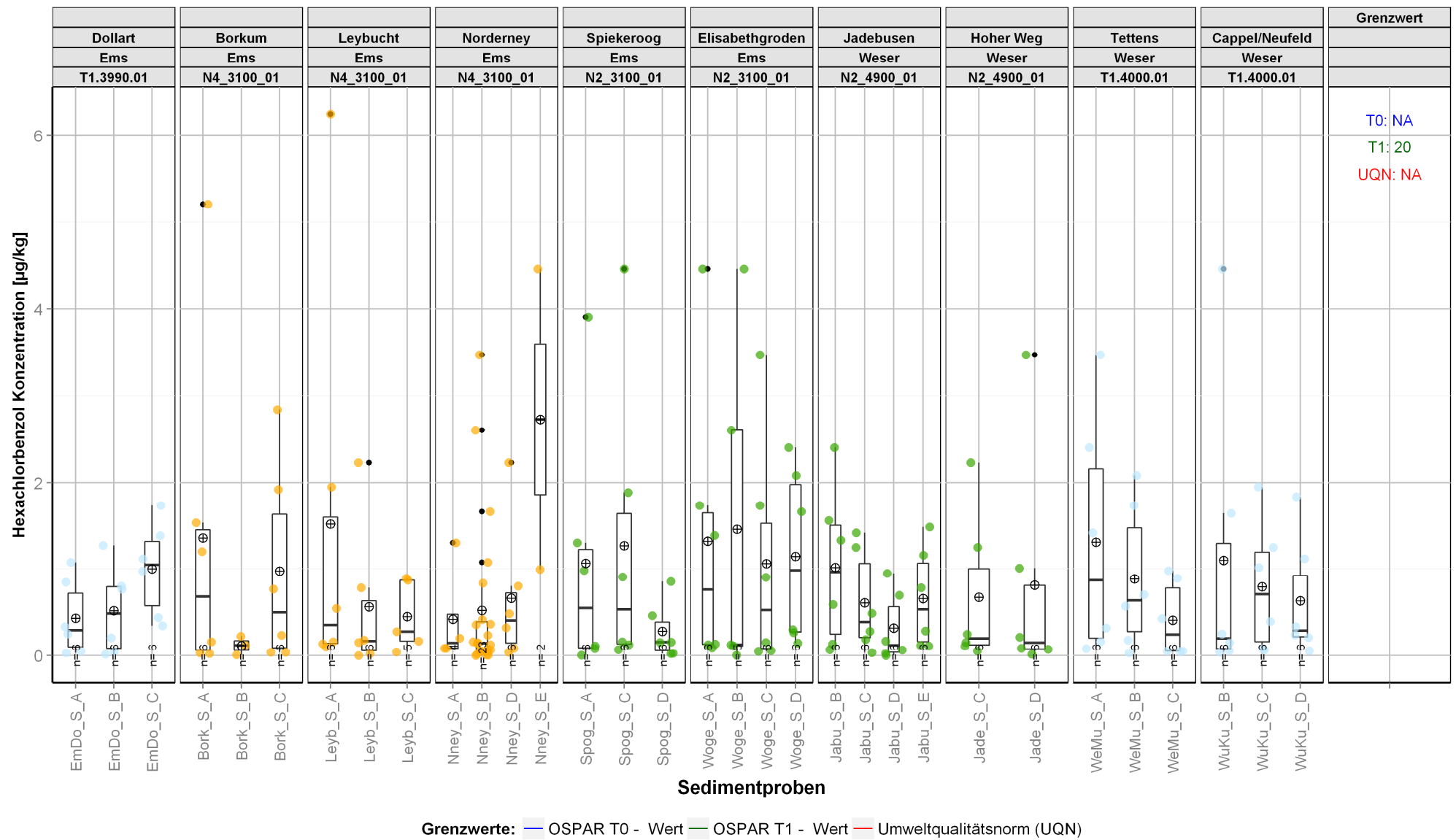


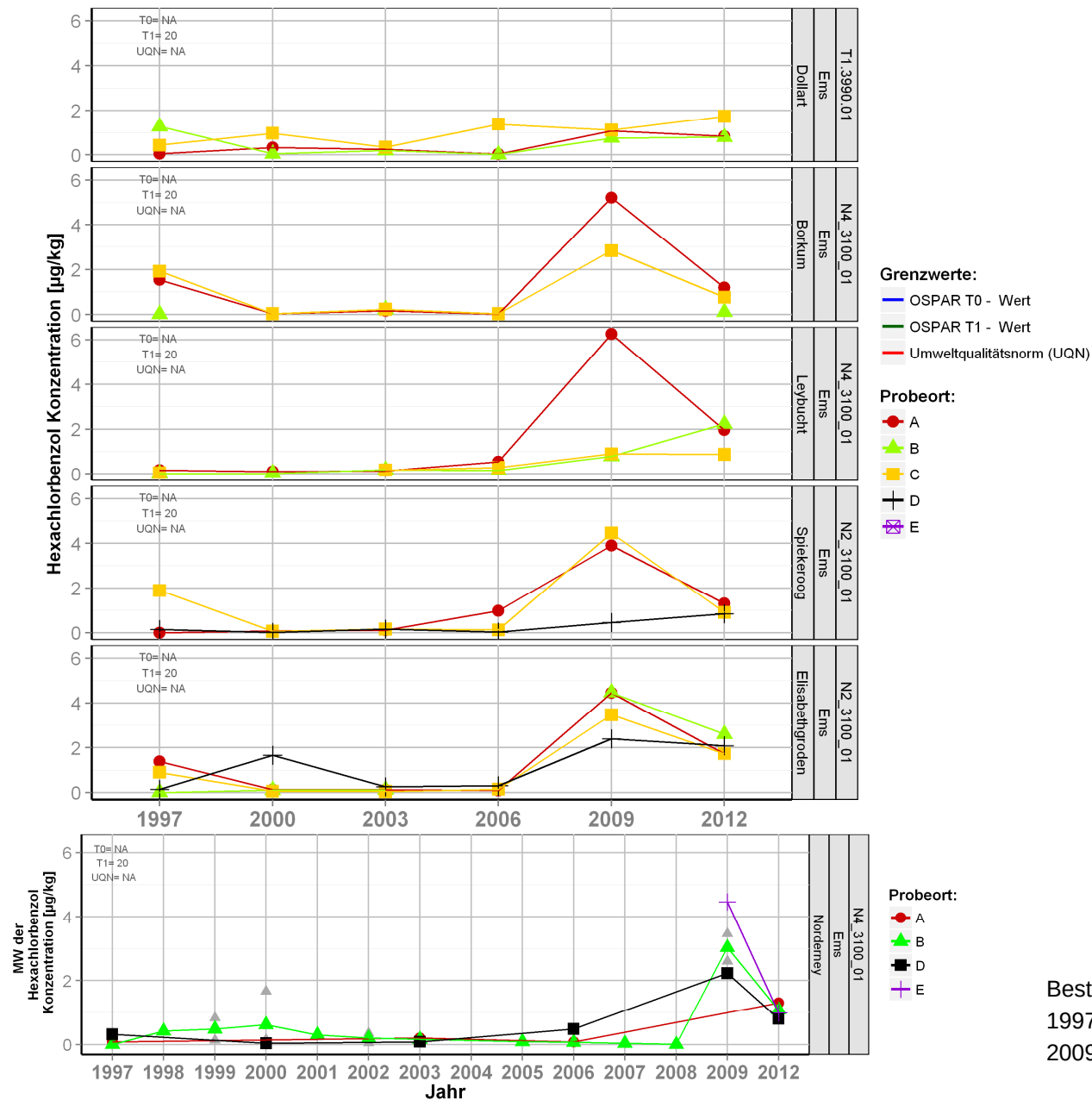


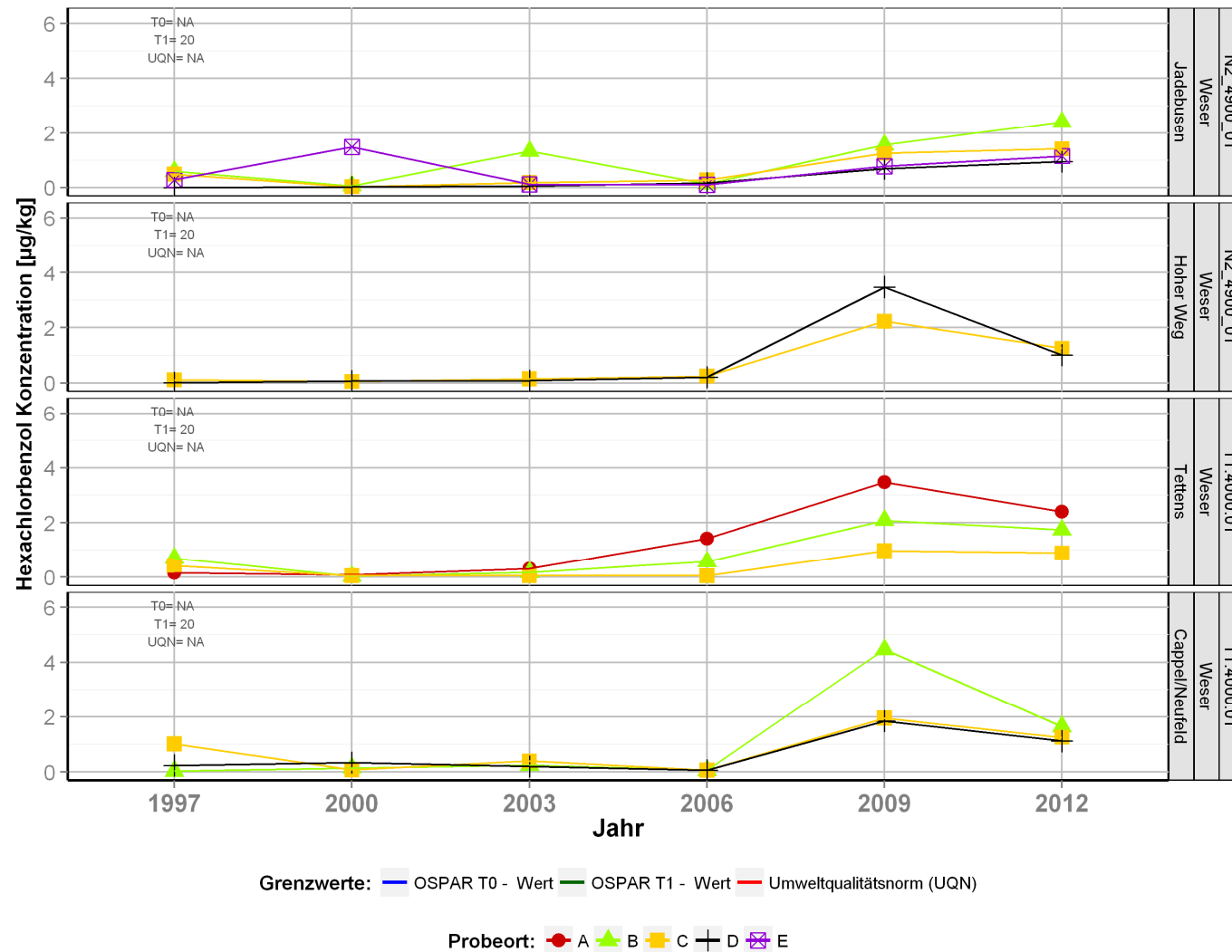




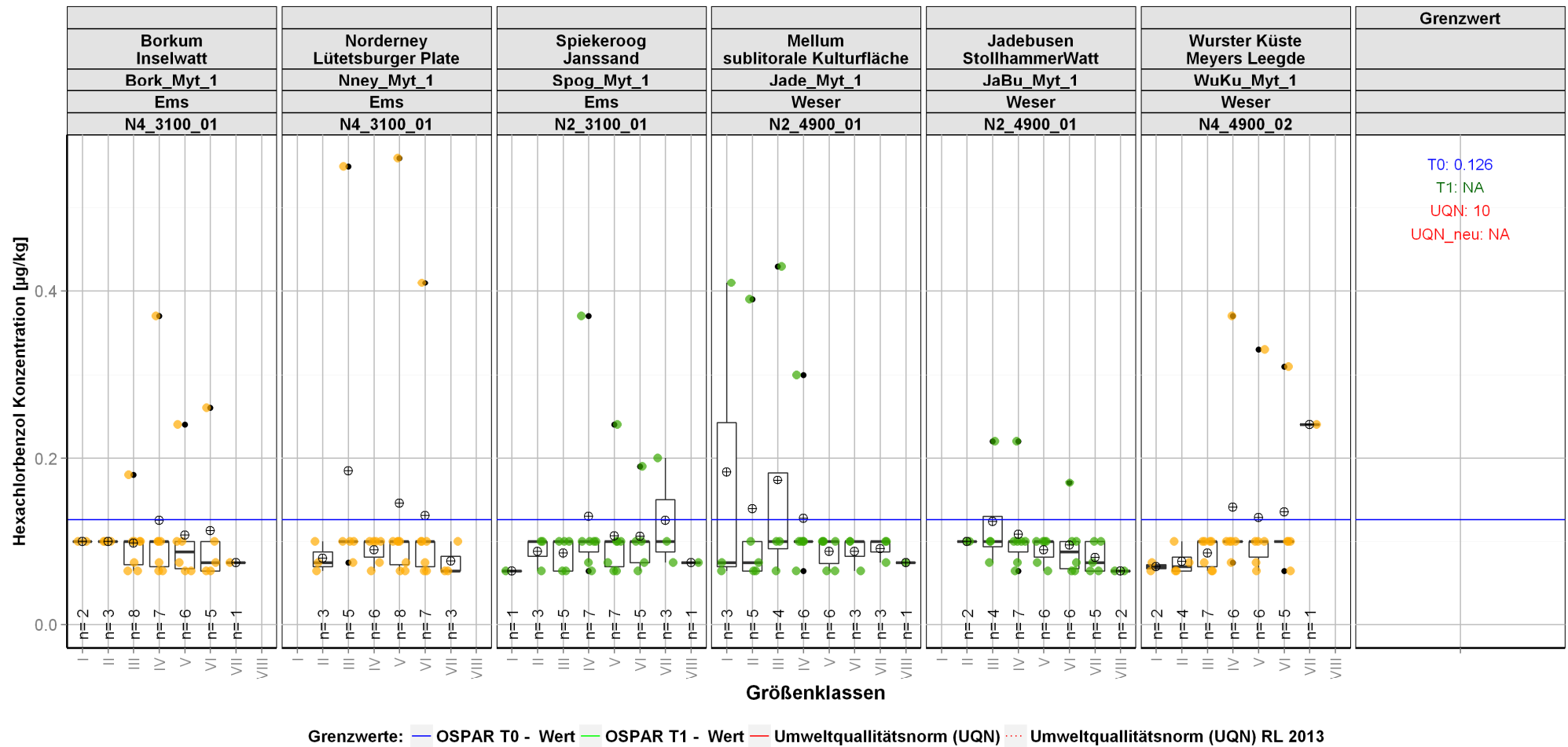
5.2 Sediment

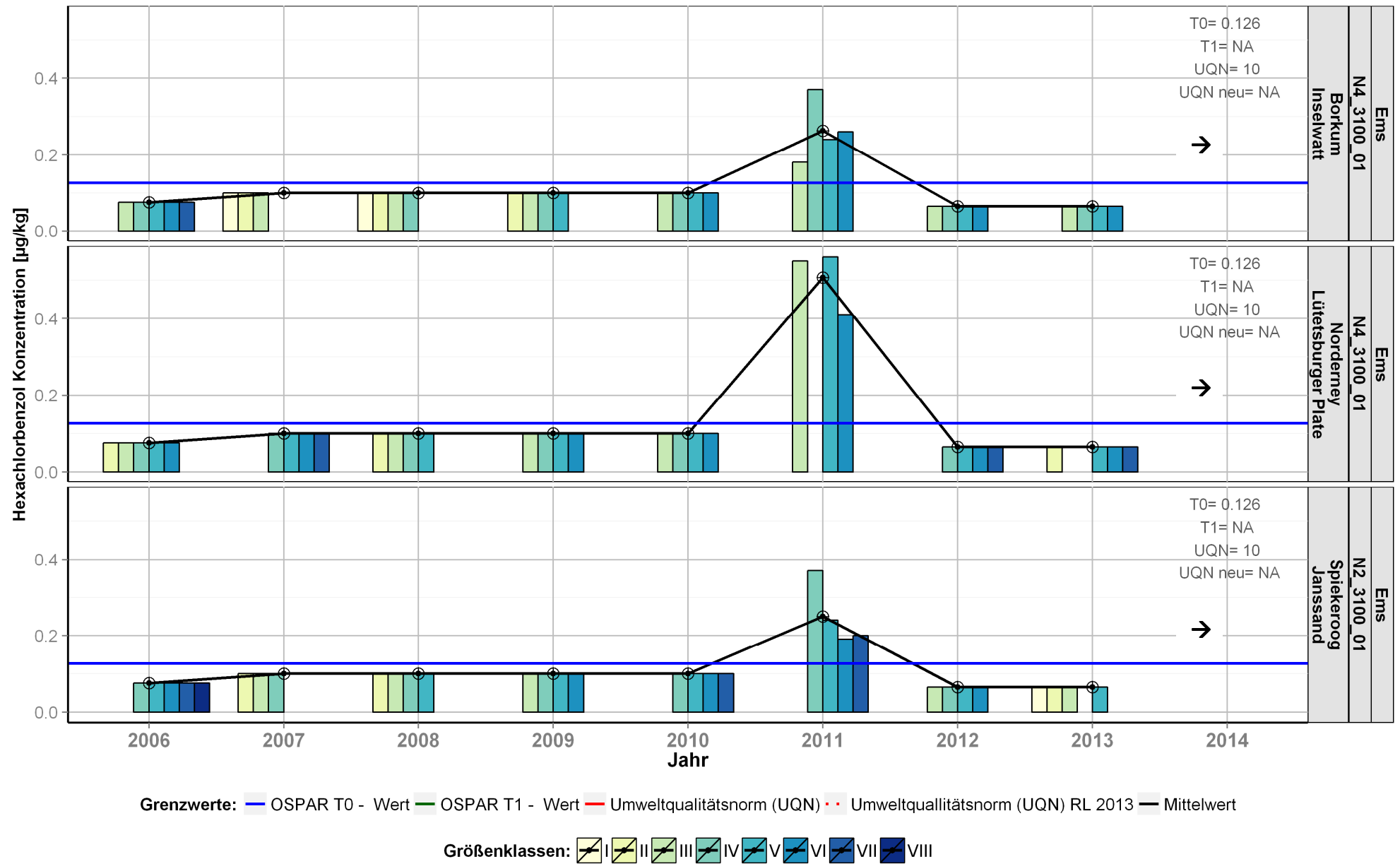


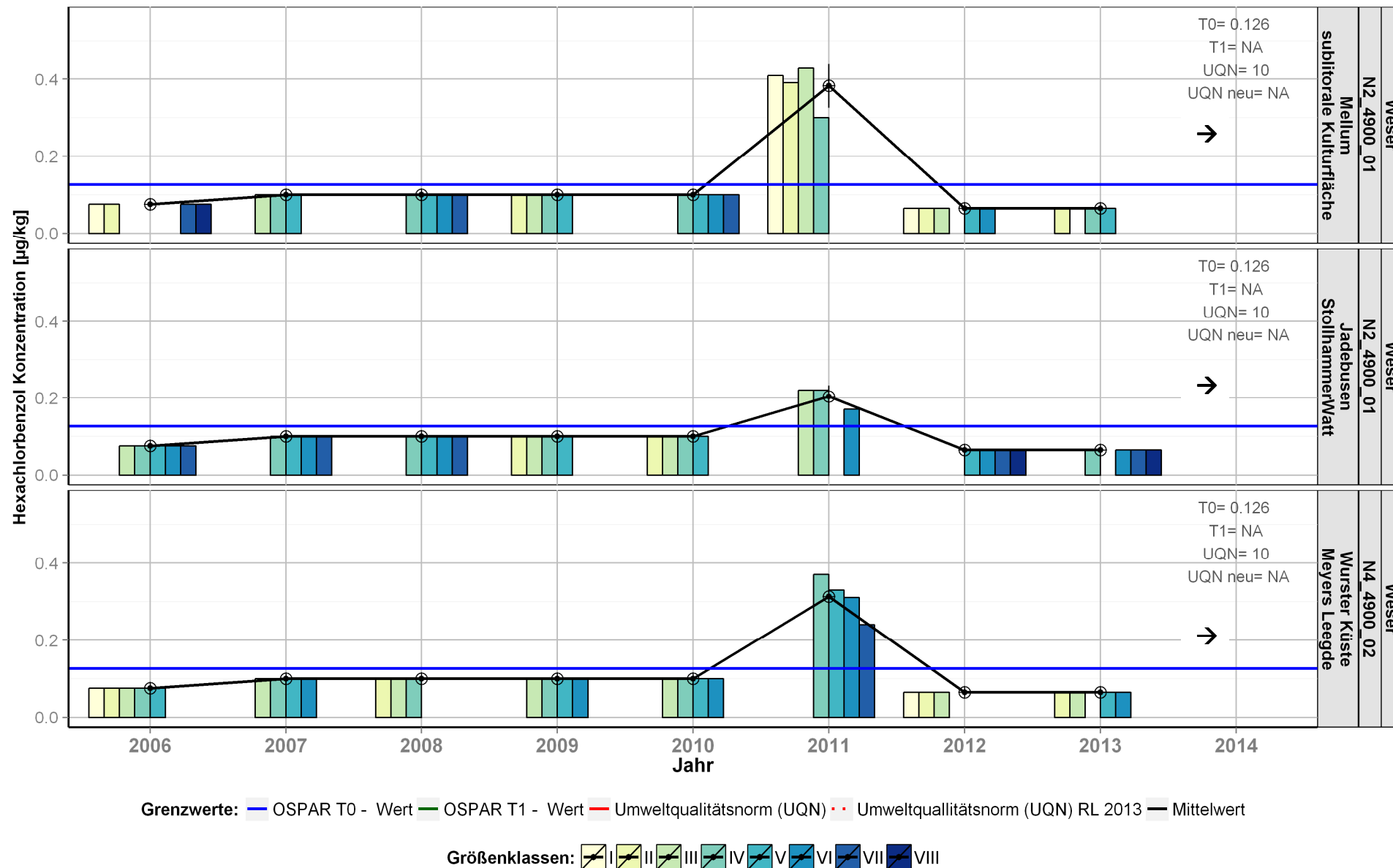




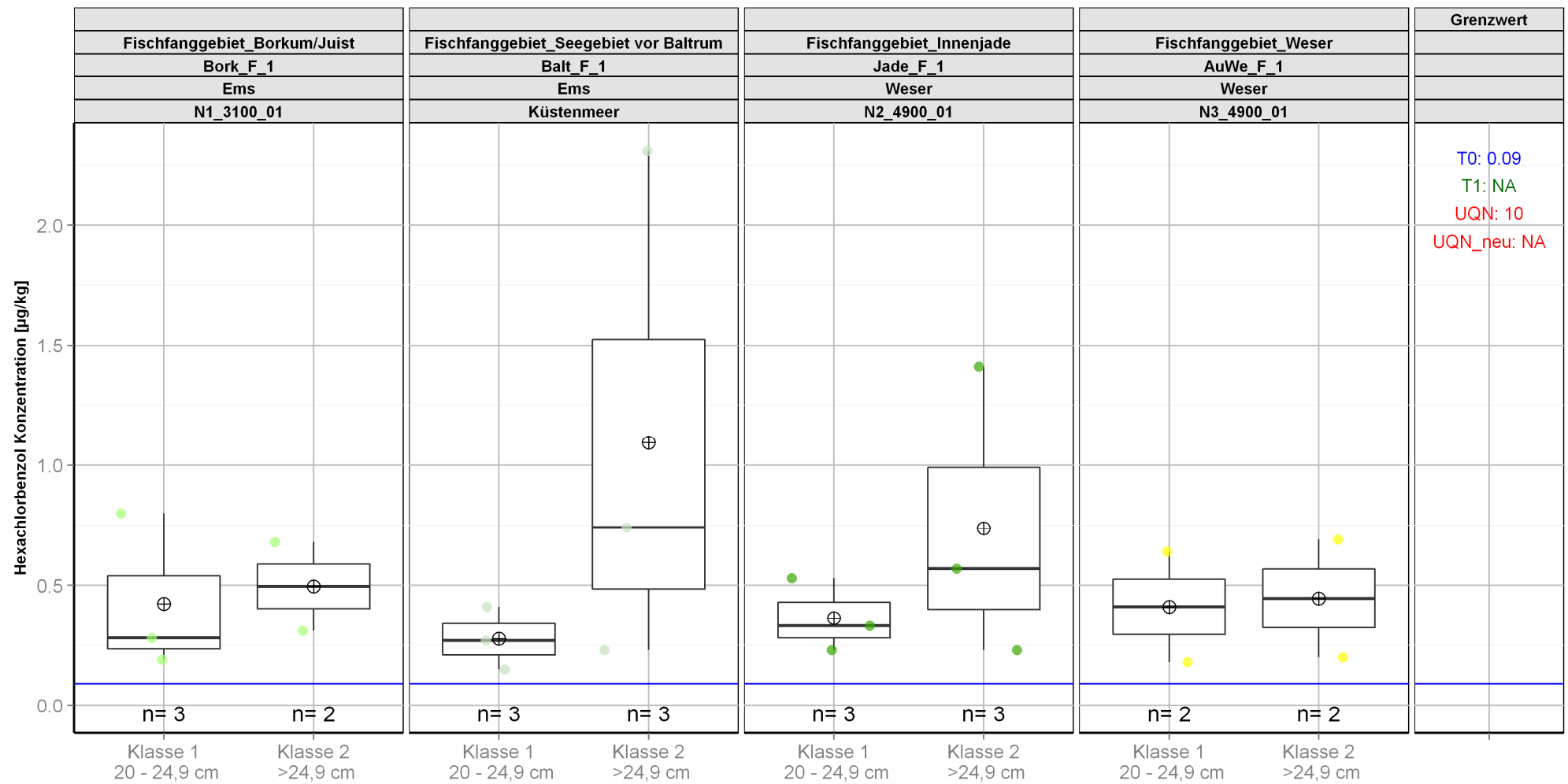
5.3 Biota



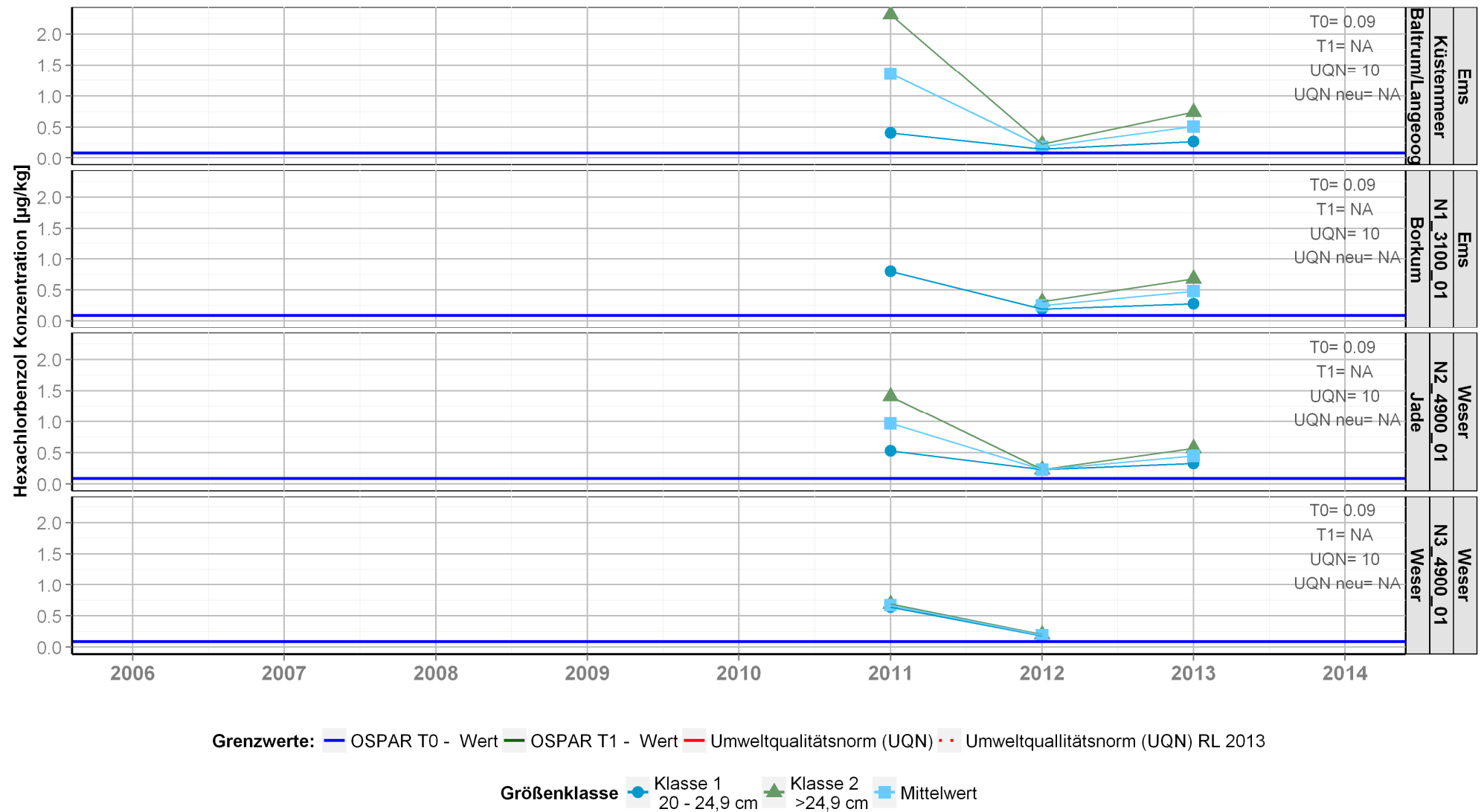




Bestimmungsgrenzen: 2006: 0,15; 2007-2010: 0,2; 2012/2013: 0,13 µg/kg



Grenzwerte: — OSPAR T0 - Wert — OSPAR T1 - Wert — Umweltqualitätsnorm (UQN) - - - Umweltqualitätsnorm (UQN) RL 2013

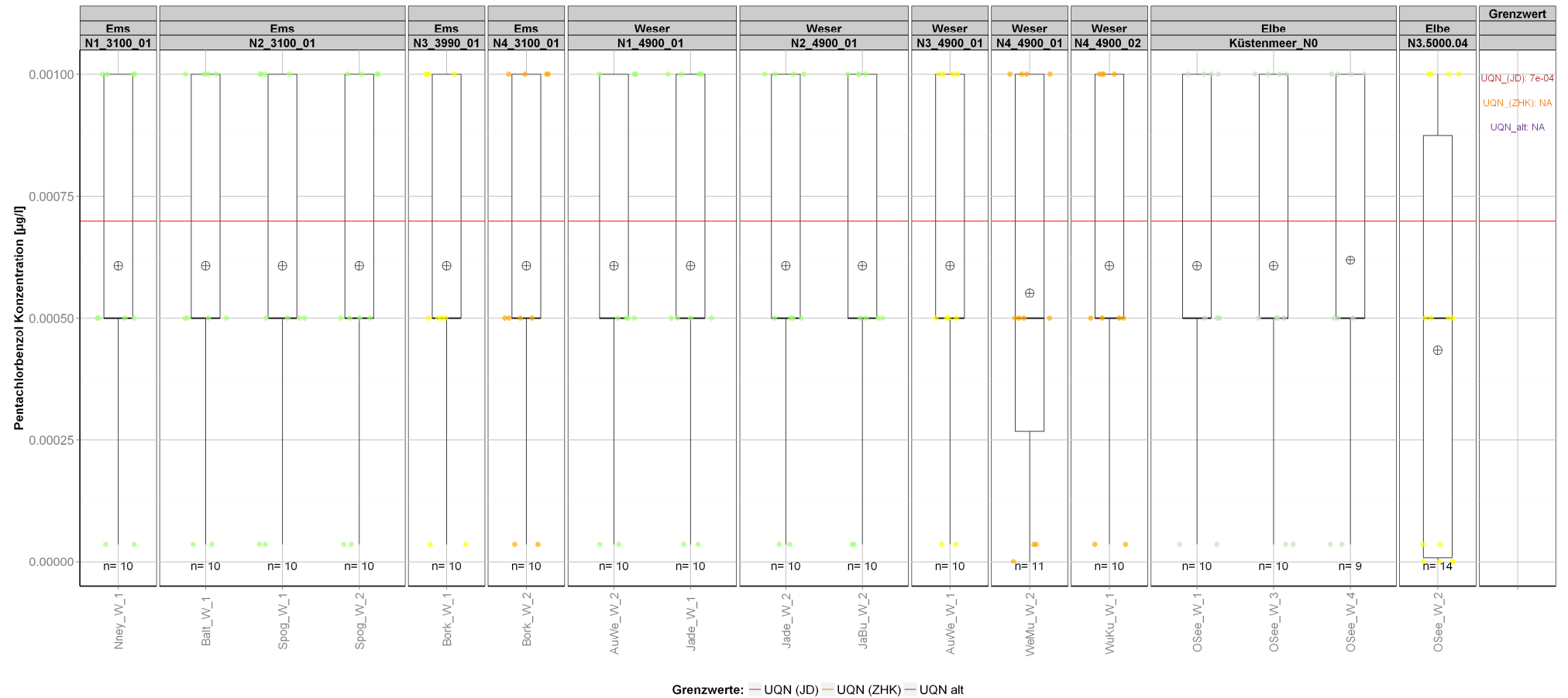


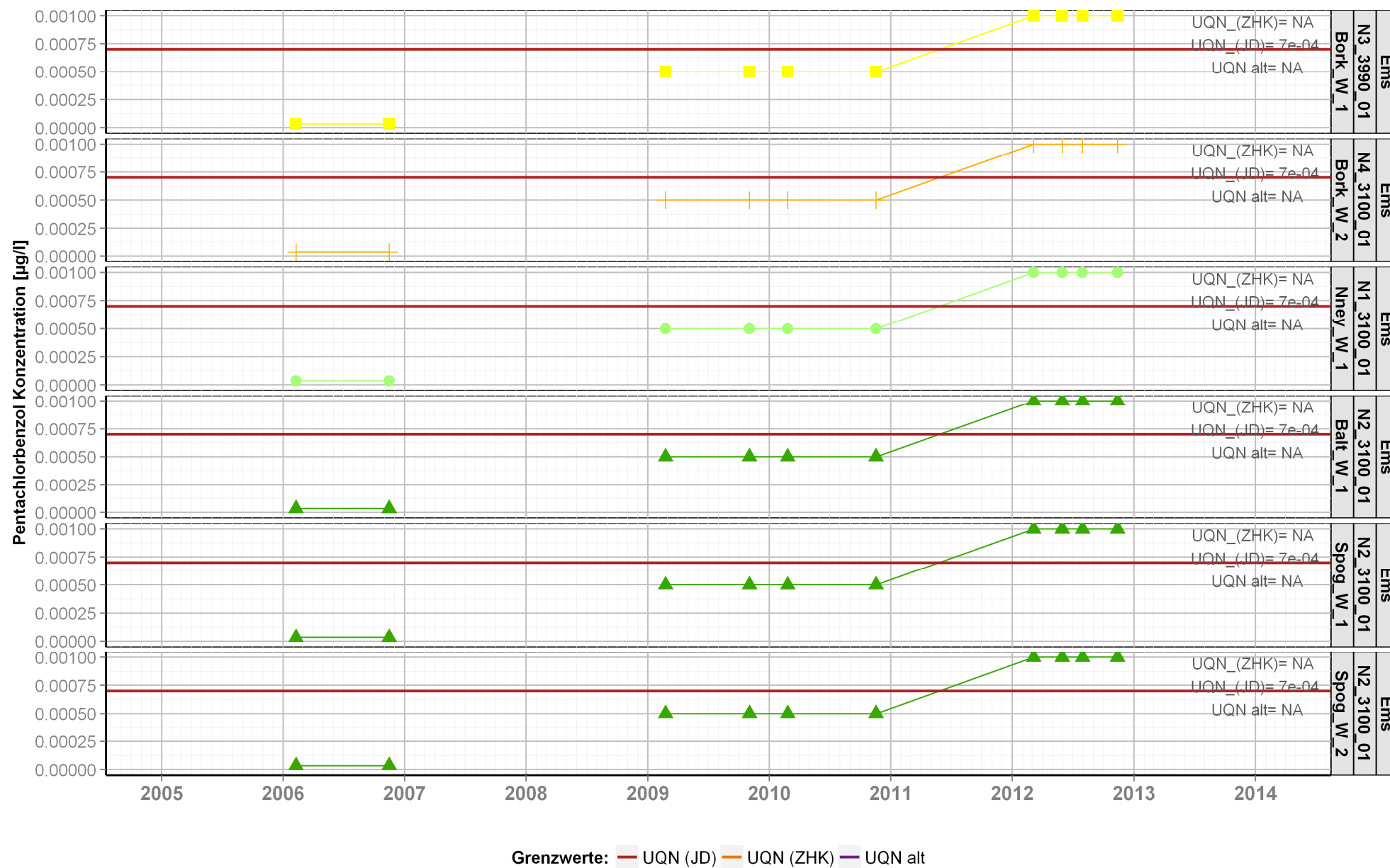
Bestimmungsgrenze:

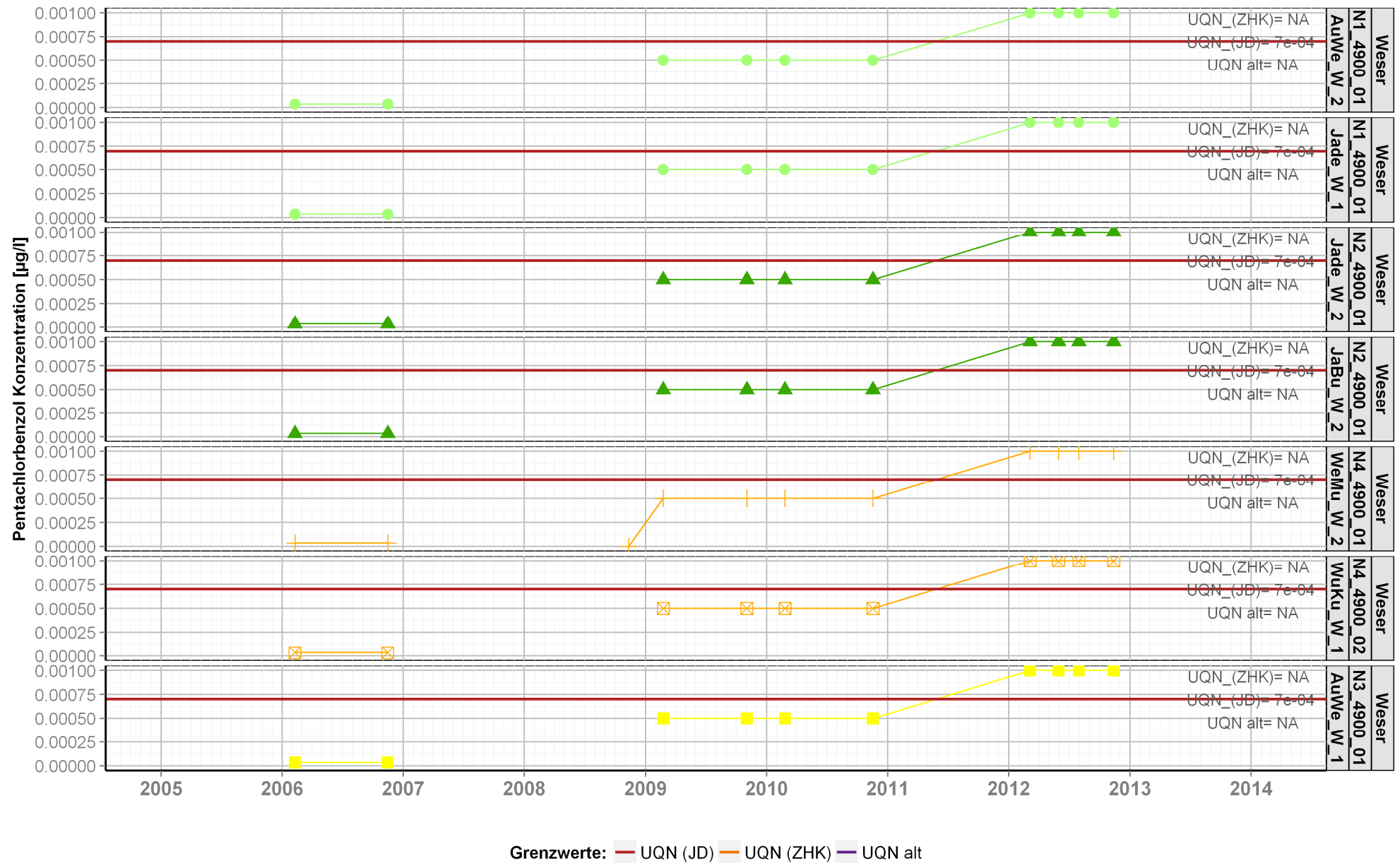
2011: 0,1; 2012-2013: 0,11 µg/kg

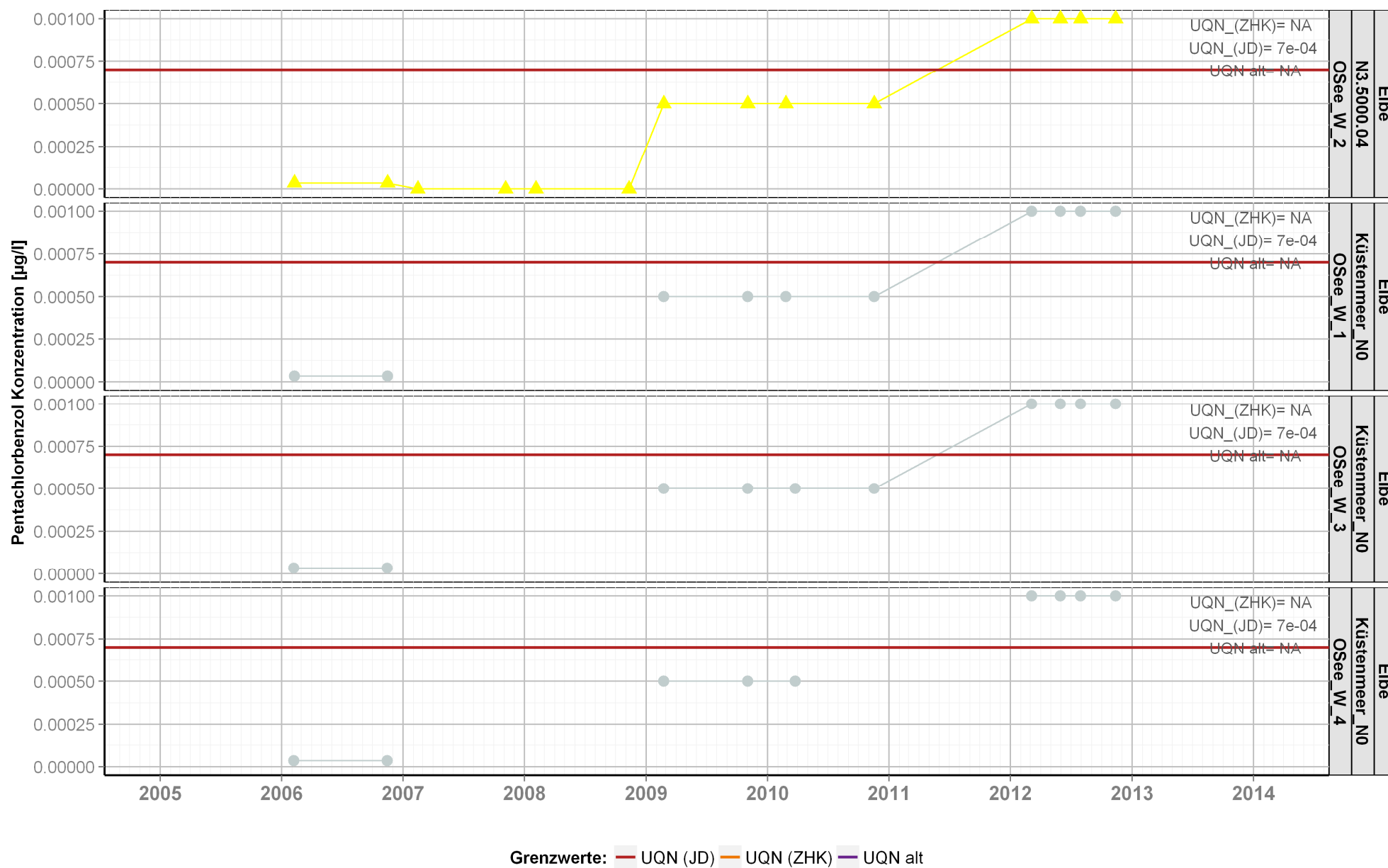
6. Pentachlorbenzol

6.1 Wasser

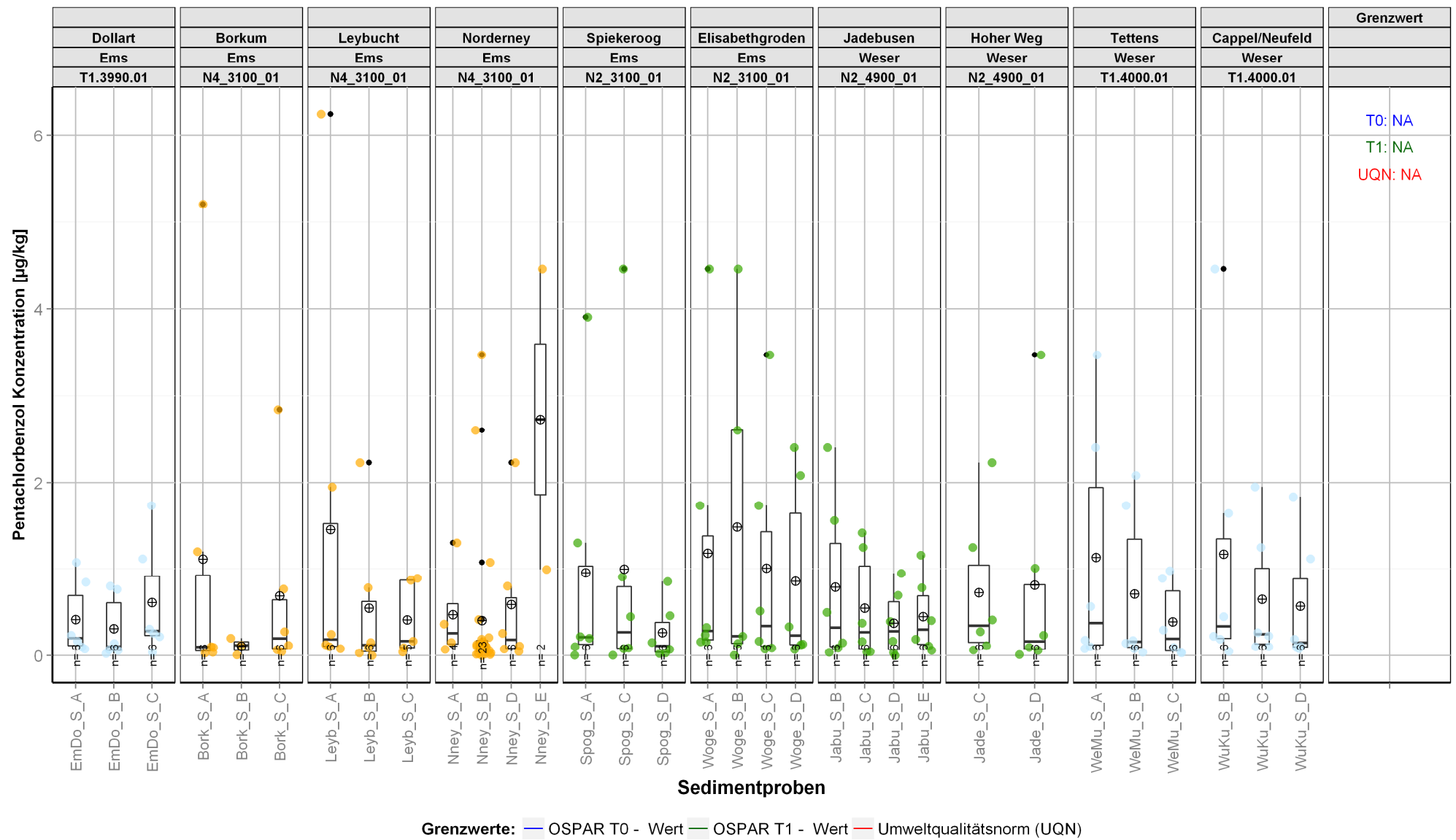


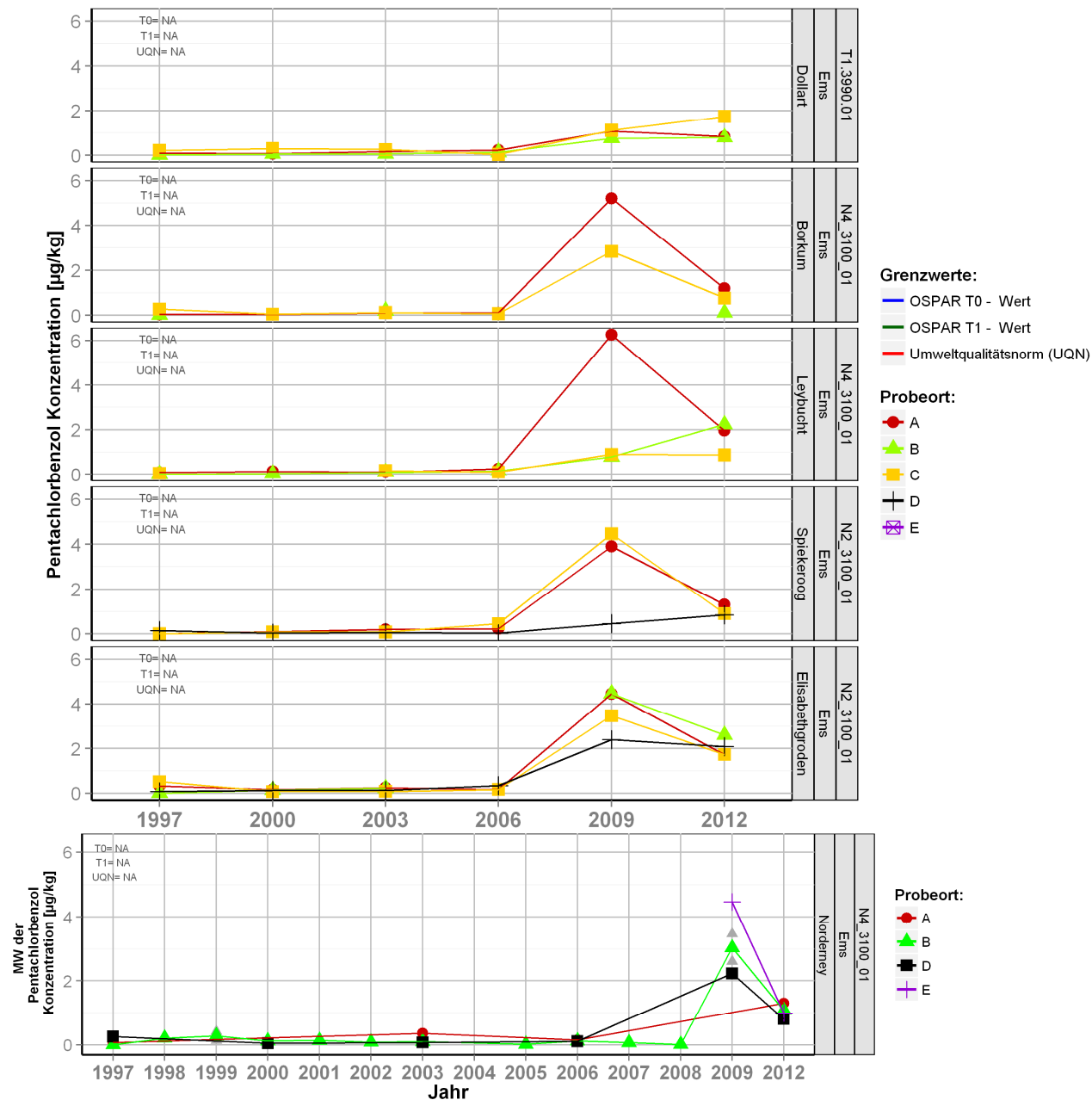


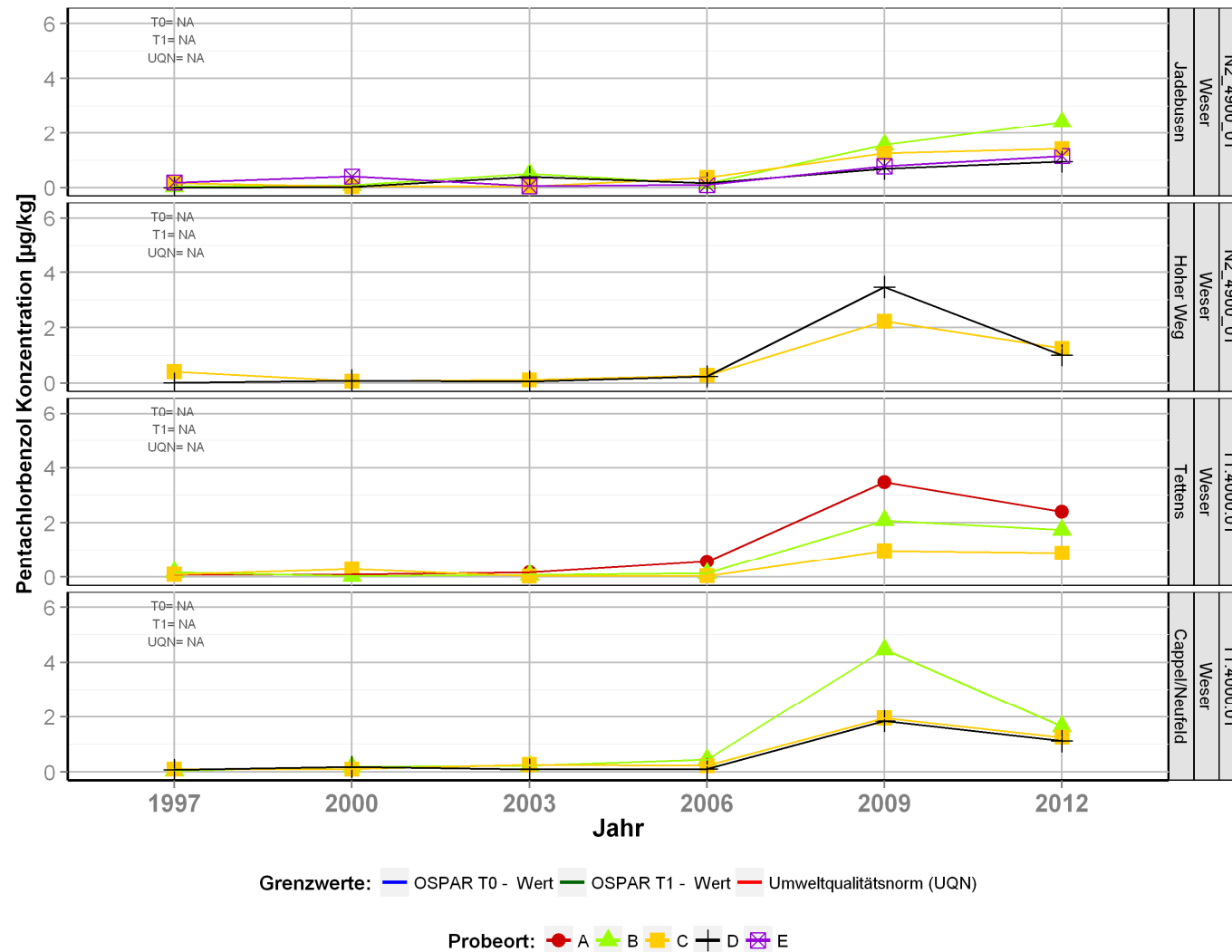




6.2 Sediment

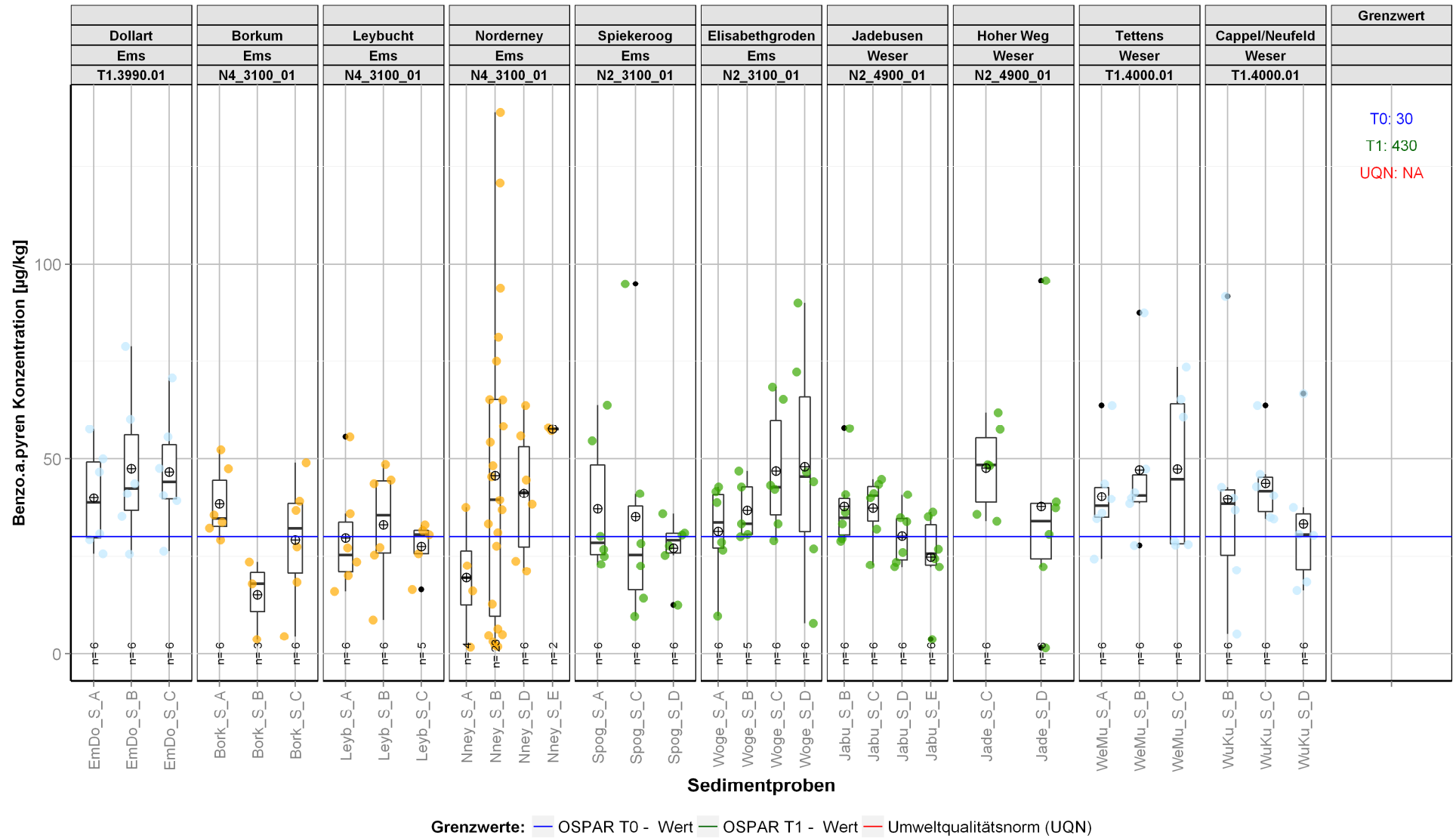


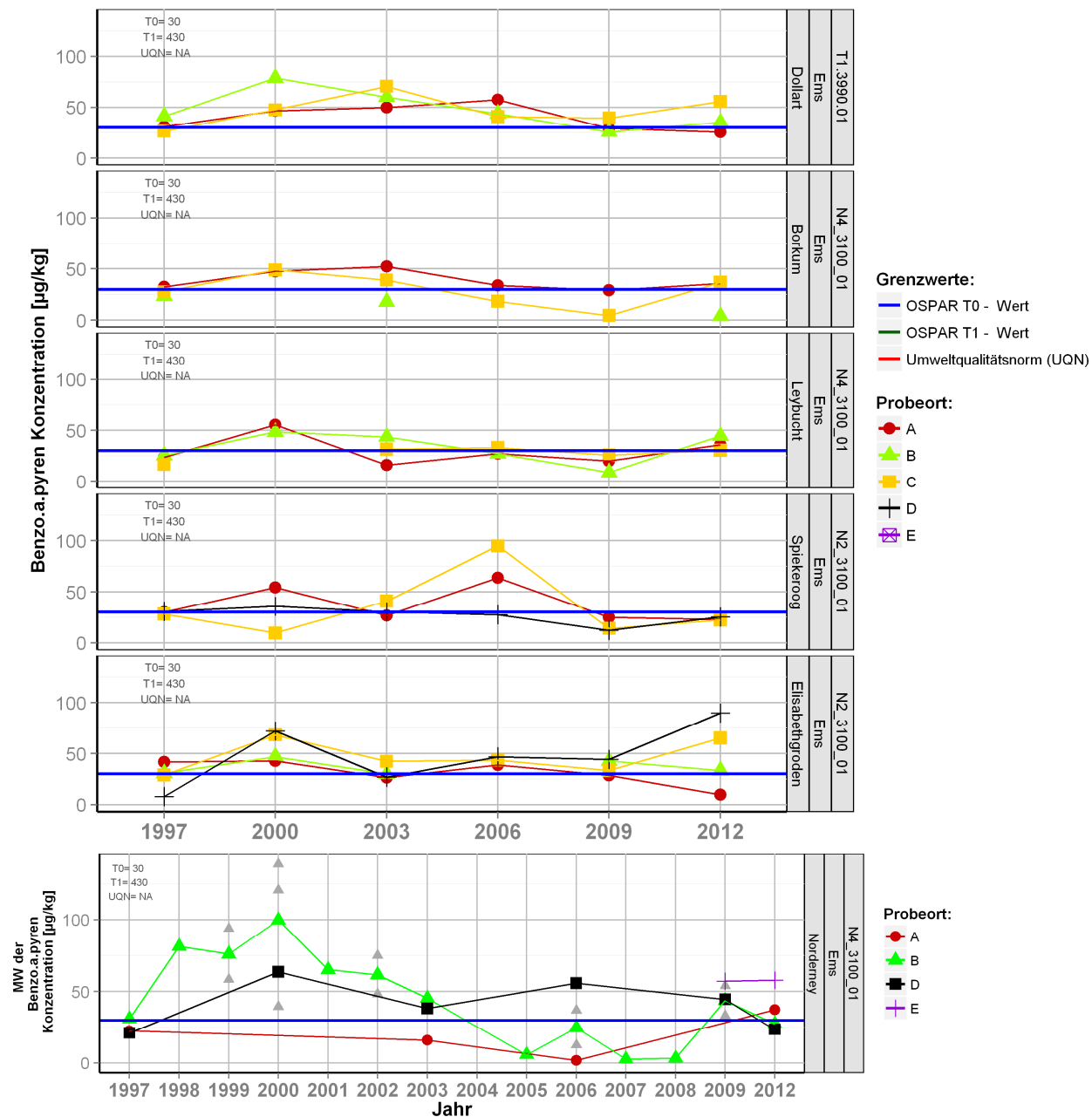




7. Benzo(a)pyren

7.1 Sediment

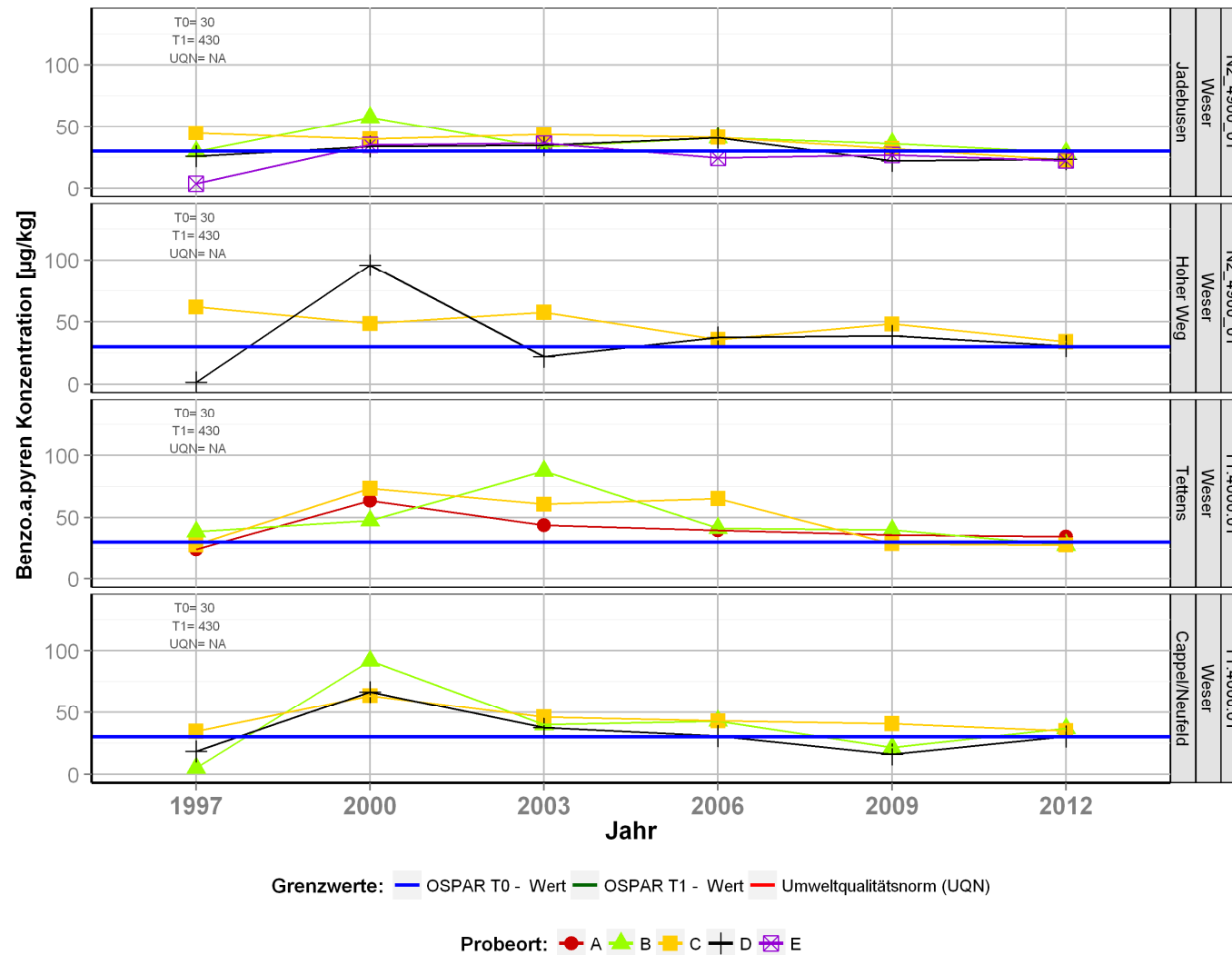




Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	→
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	→
Leyb_S_C	→
Spog_S_A	→
Spog_S_C	→
Woge_S_A	→
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	→
Nney_S_D	→

Bestimmungsgrenze 2006: 1 µg/kg

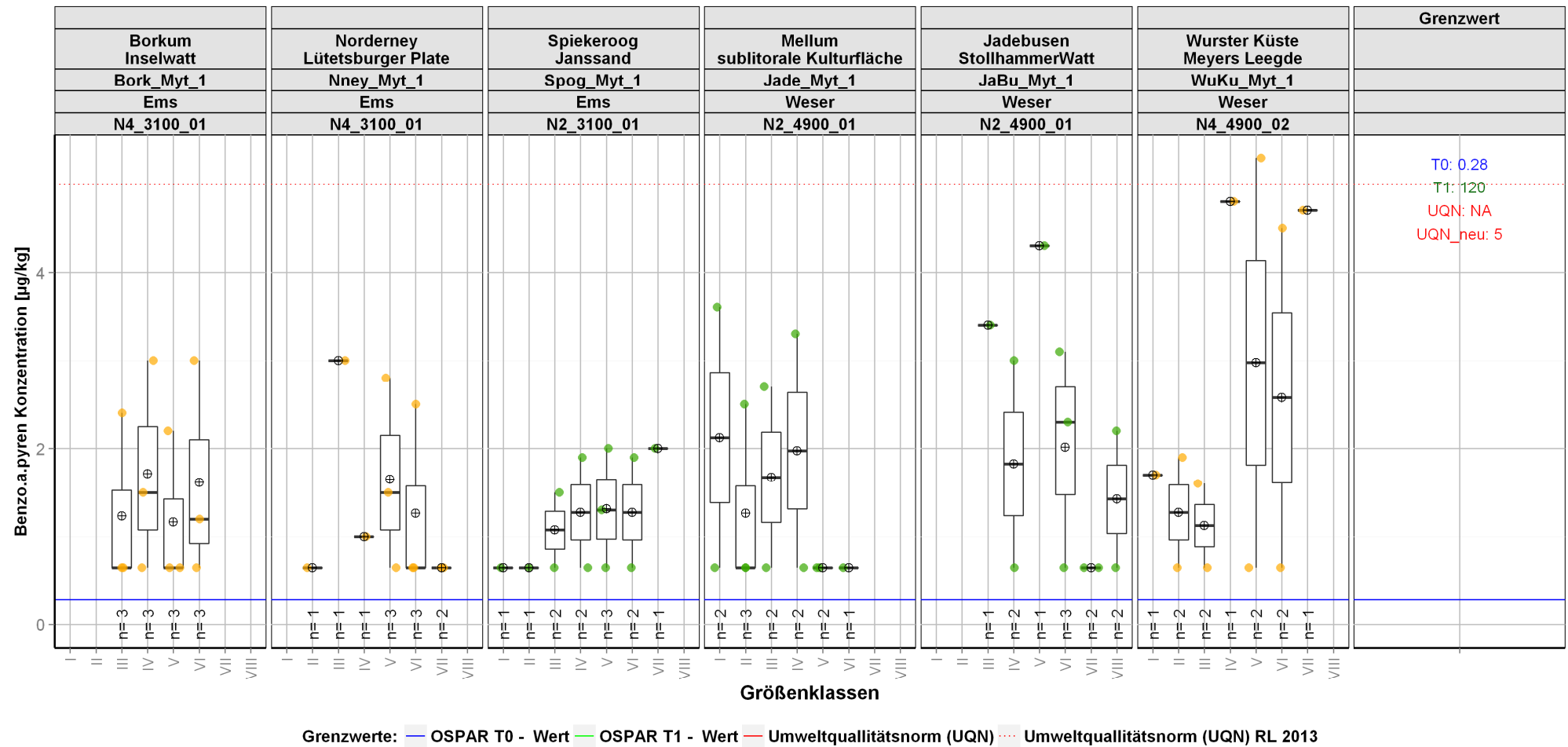


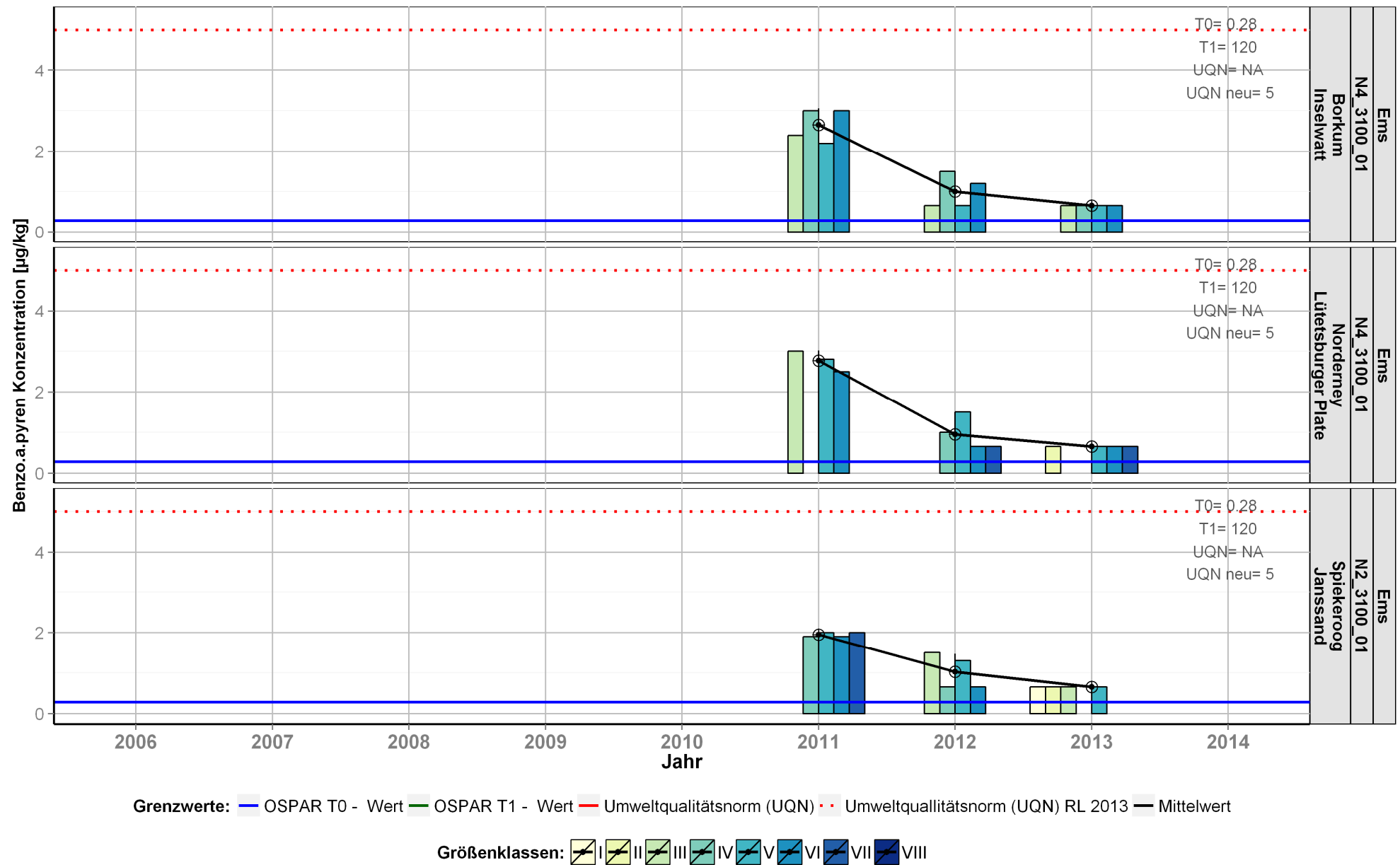


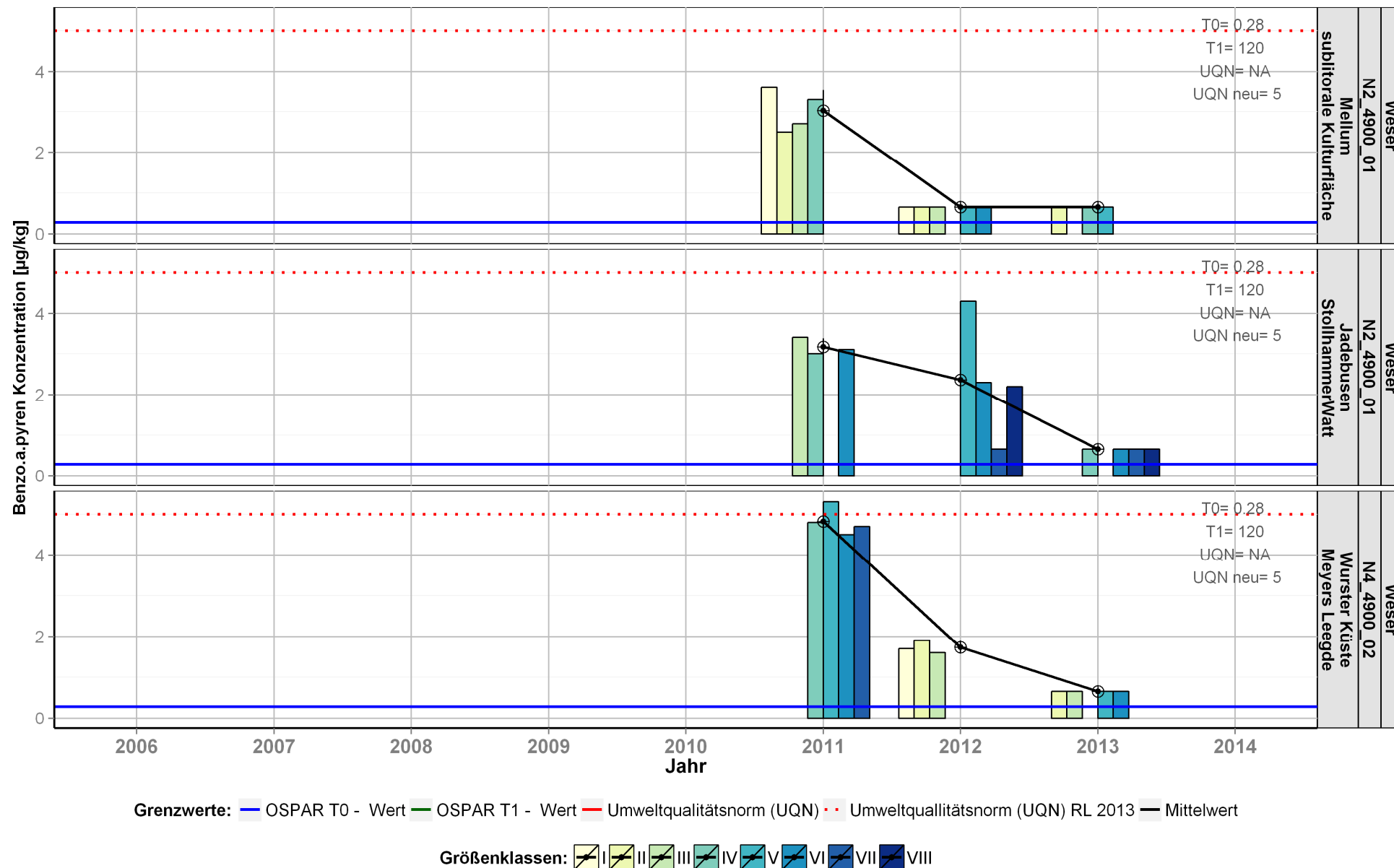
Station	Trend
Jabu_S_B	→
Jabu_S_C	↓
Jabu_S_D	→
Jabu_S_E	→
Jade_S_C	↓
Jade_S_D	→
WeMu_S_A	→
WeMu_S_B	→
WeMu_S_C	→
WuKu_S_B	→
WuKu_S_C	→
WuKu_S_D	→



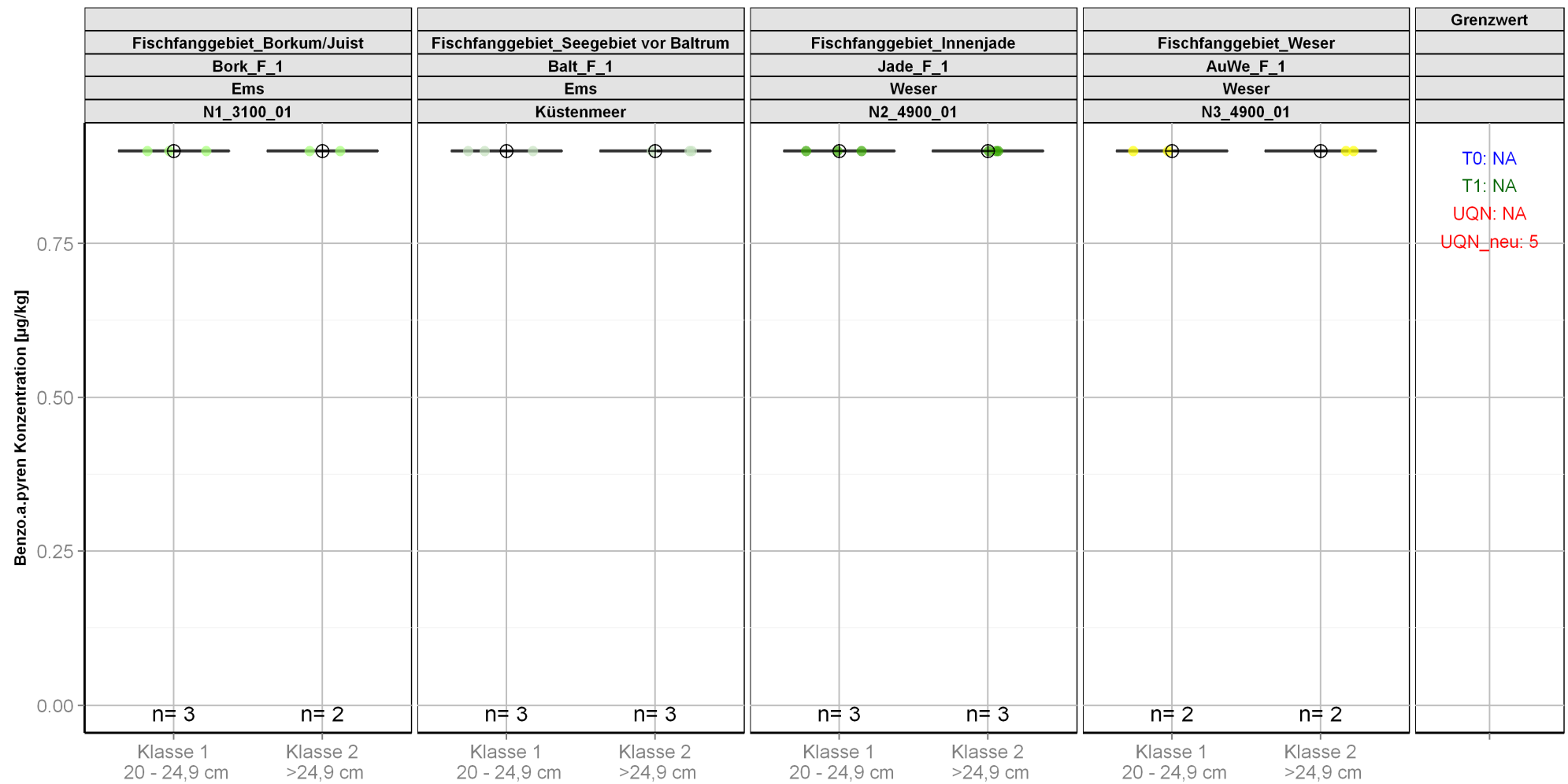
7.2 Biota



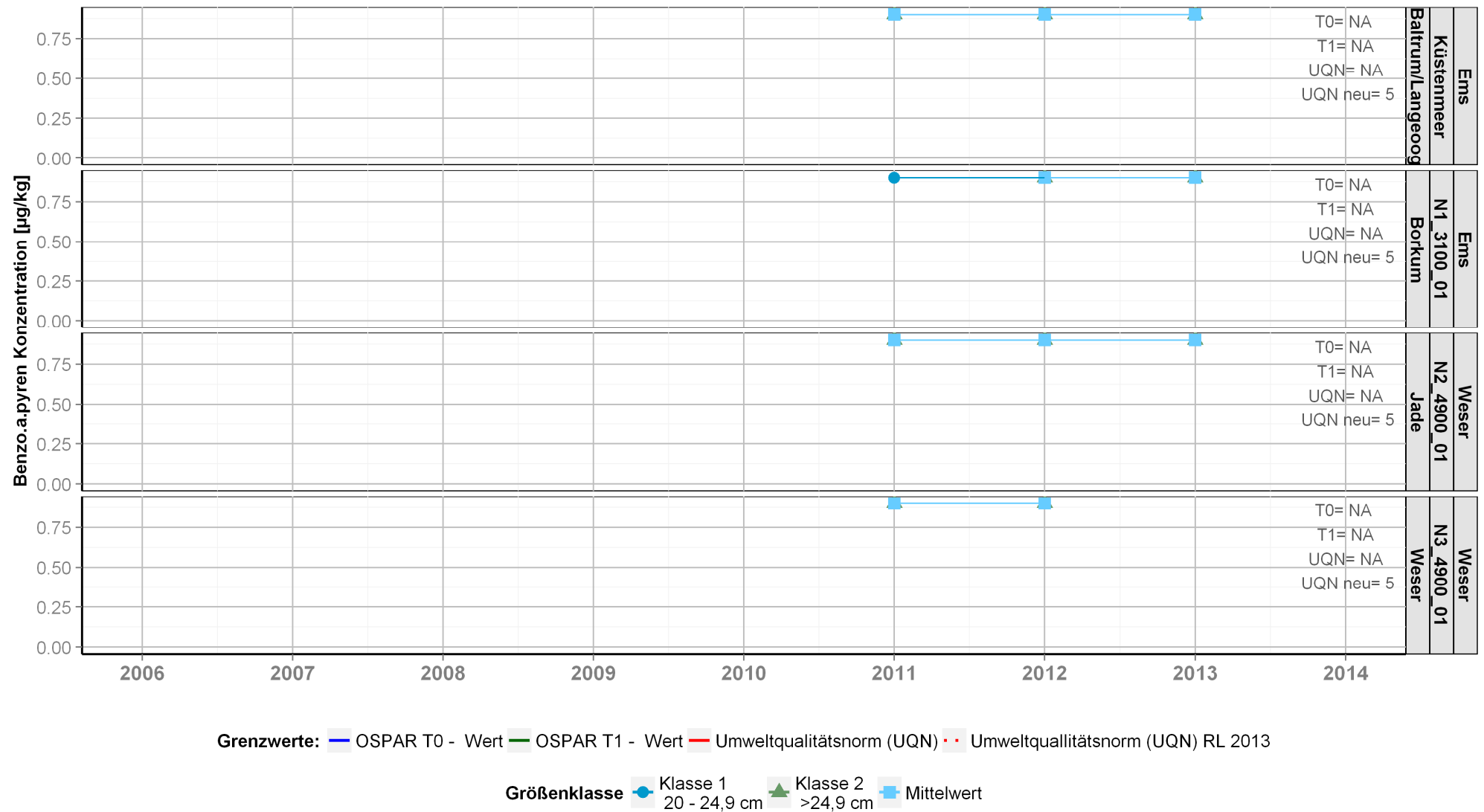




Bestimmungsgrenze: 1,3 µg/kg



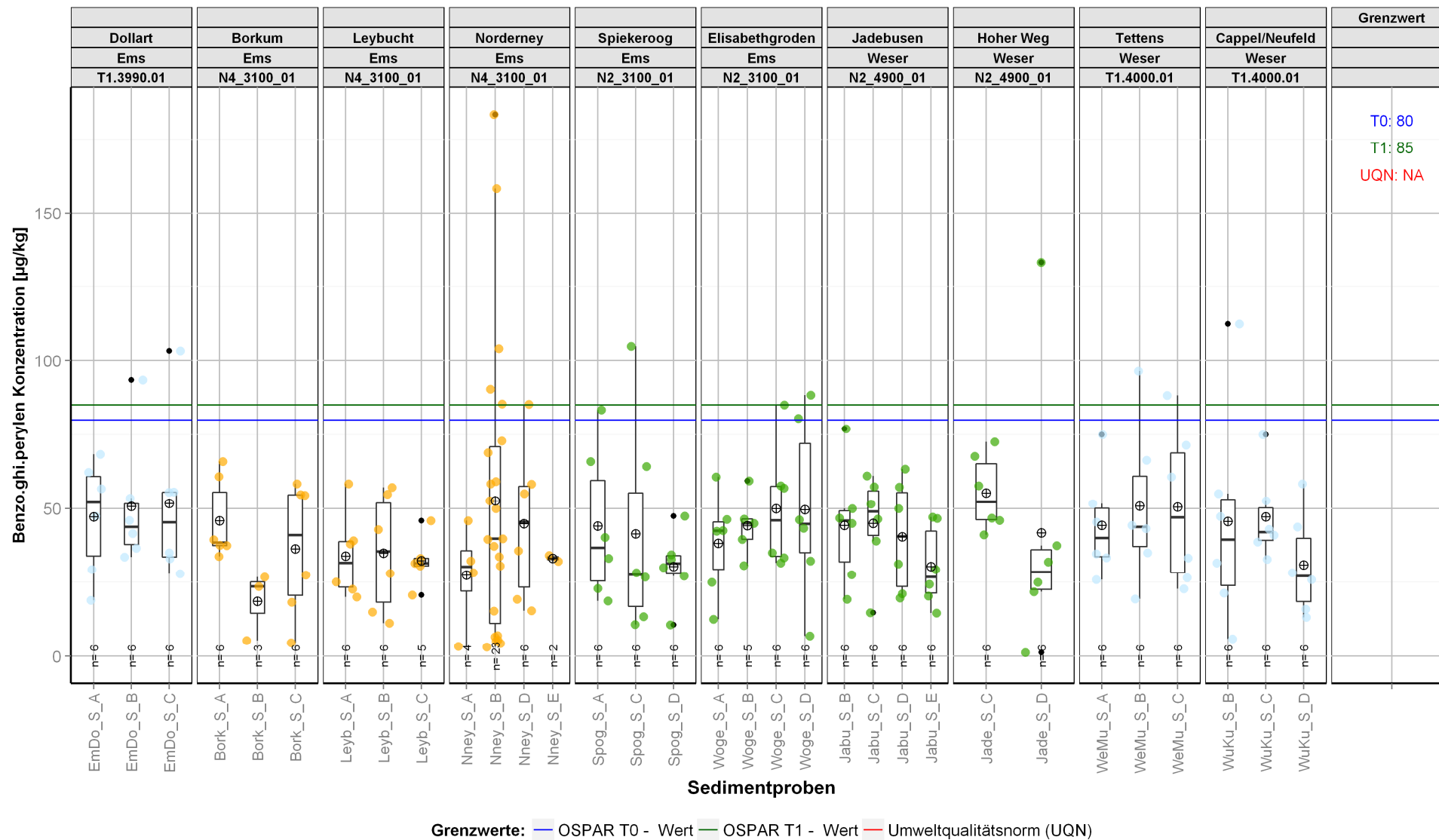
Grenzwerte:
 — OSPAR T0 - Wert
 — OSPAR T1 - Wert
 — Umweltqualitätsnorm (UQN)
 - - Umweltqualitätsnorm (UQN) RL 2013

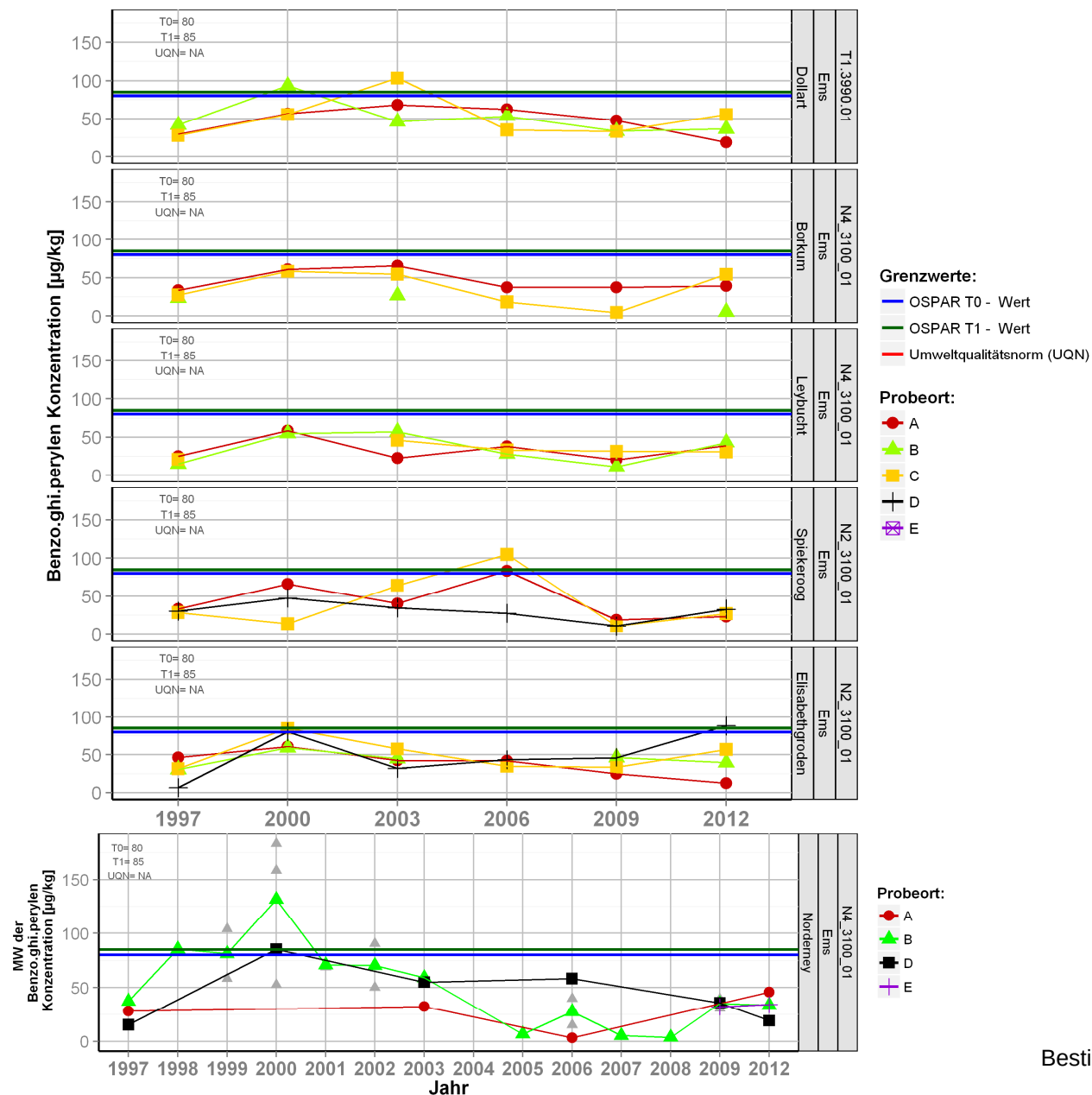


Bestimmungsgrenze: 2011-2013: 1,8 $\mu\text{g/kg}$

8. Benzo(ghi)perylene

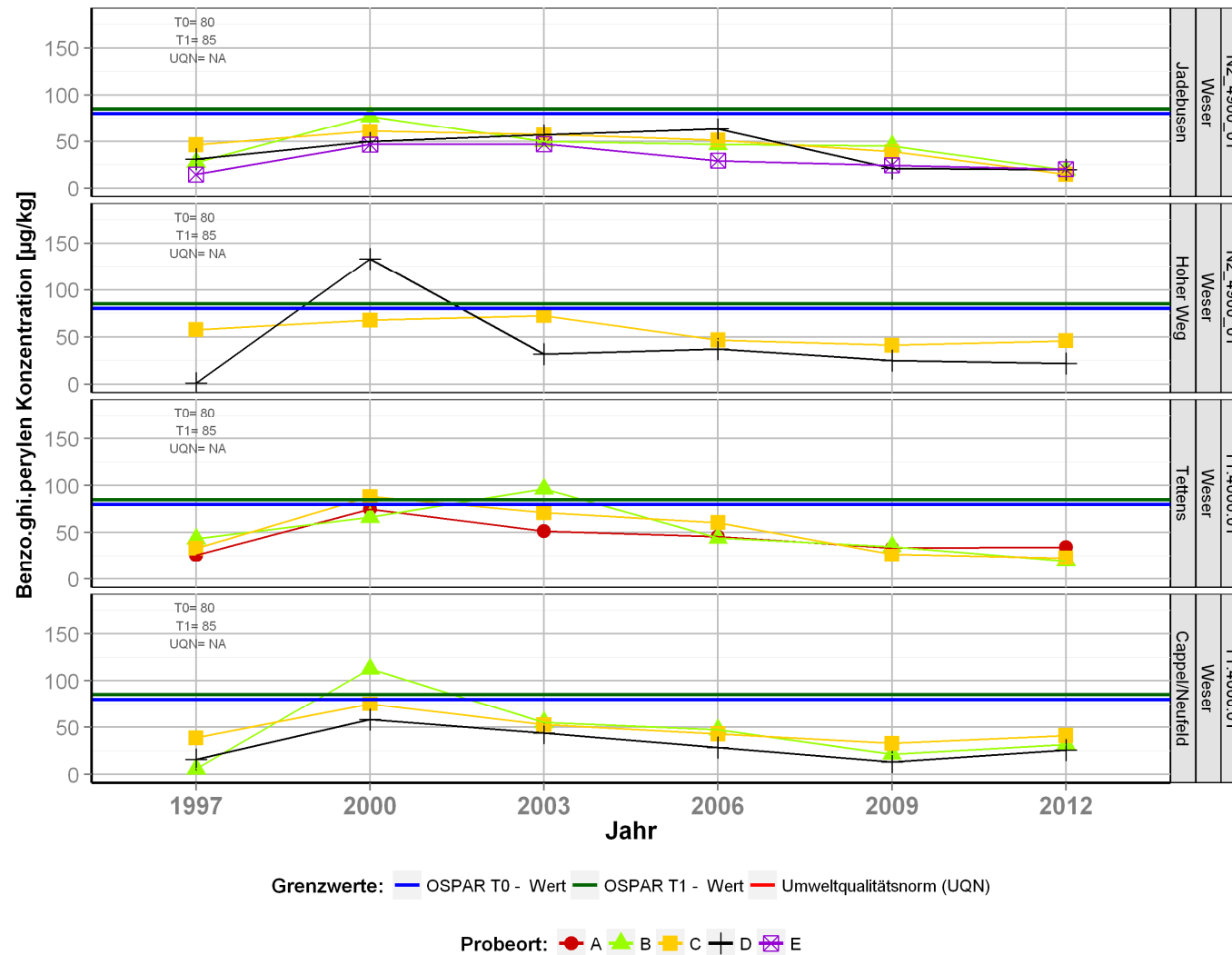
8.1 Sediment





Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	→
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	→
Leyb_S_C	→
Spog_S_A	→
Spog_S_C	→
Woge_S_A	↓
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	→
Nney_S_D	→

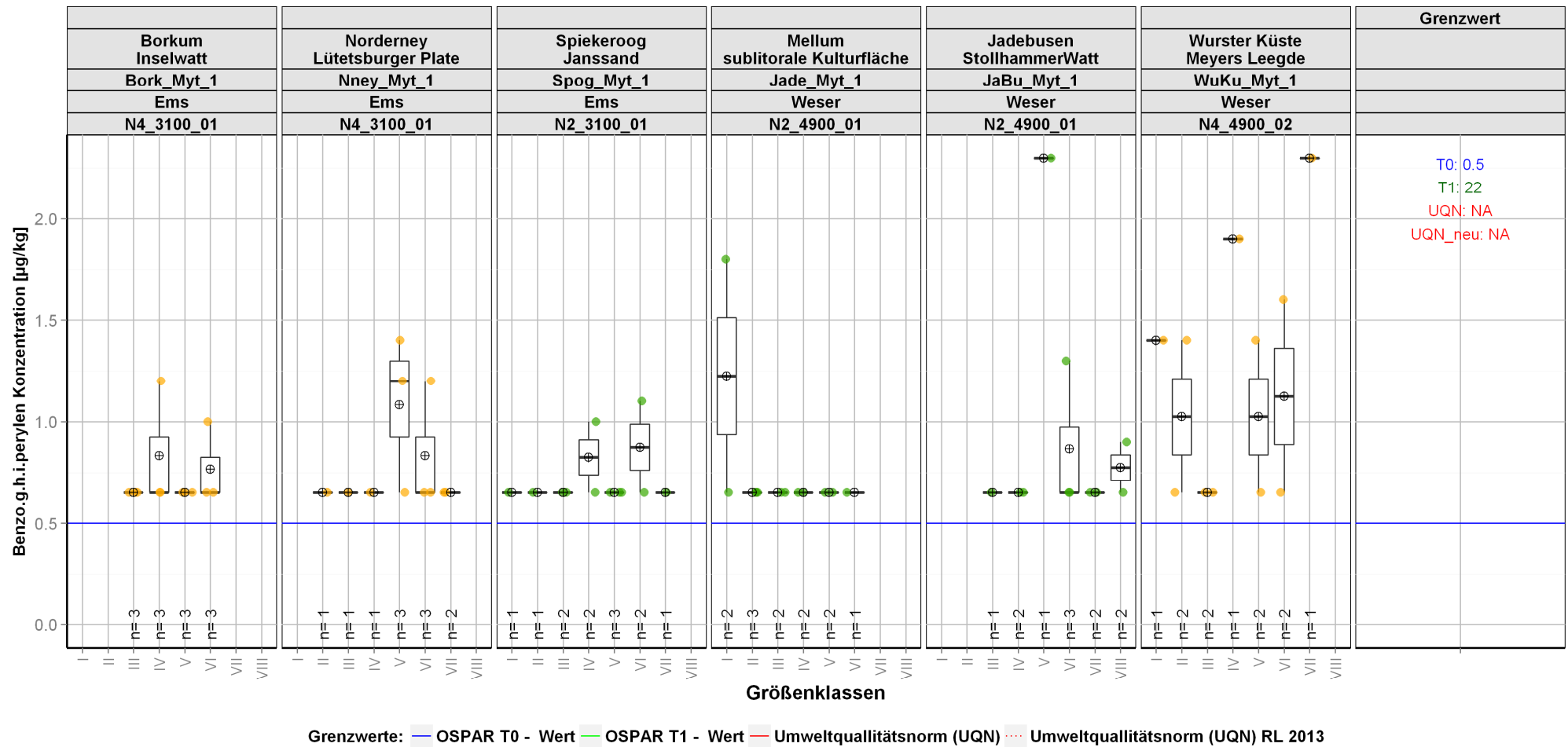
 Bestimmungsgrenze 2009: $1 \mu\text{g/kg}$

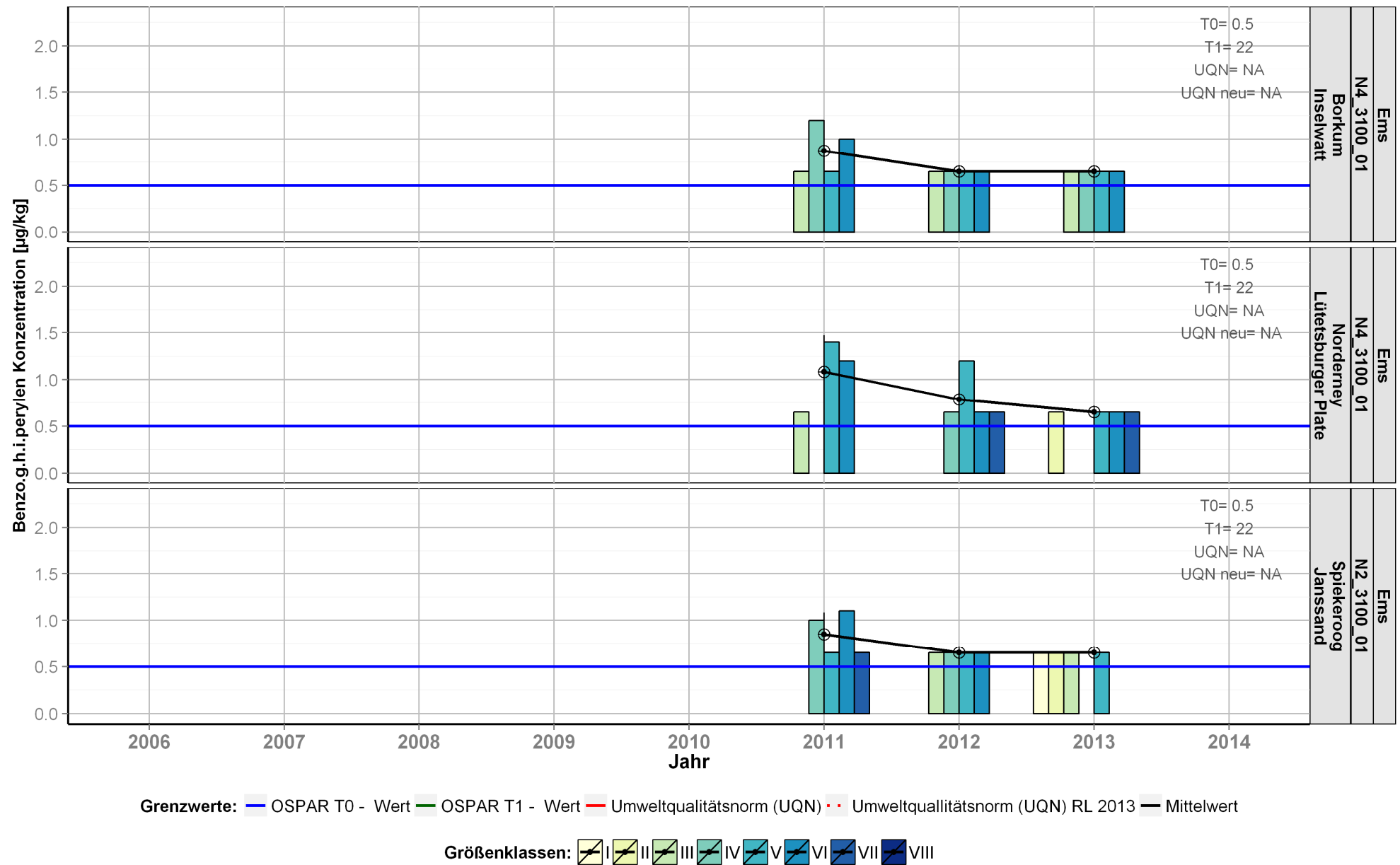



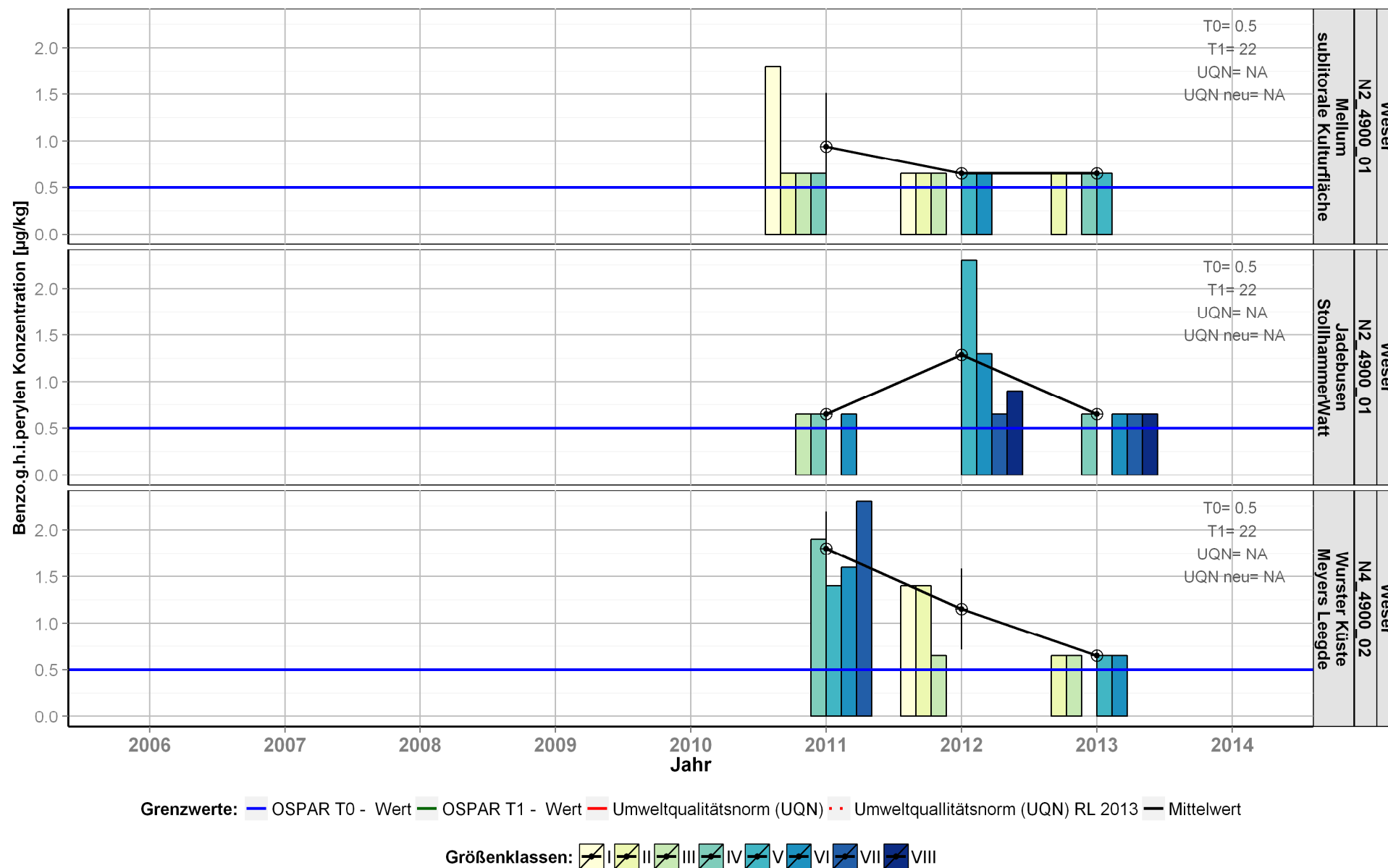
Station	Trend
Jabu_S_B	→
Jabu_S_C	→
Jabu_S_D	→
Jabu_S_E	→
Jade_S_C	→
Jade_S_D	→
WeMu_S_A	→
WeMu_S_B	→
WeMu_S_C	→
WuKu_S_B	→
WuKu_S_C	→
WuKu_S_D	→



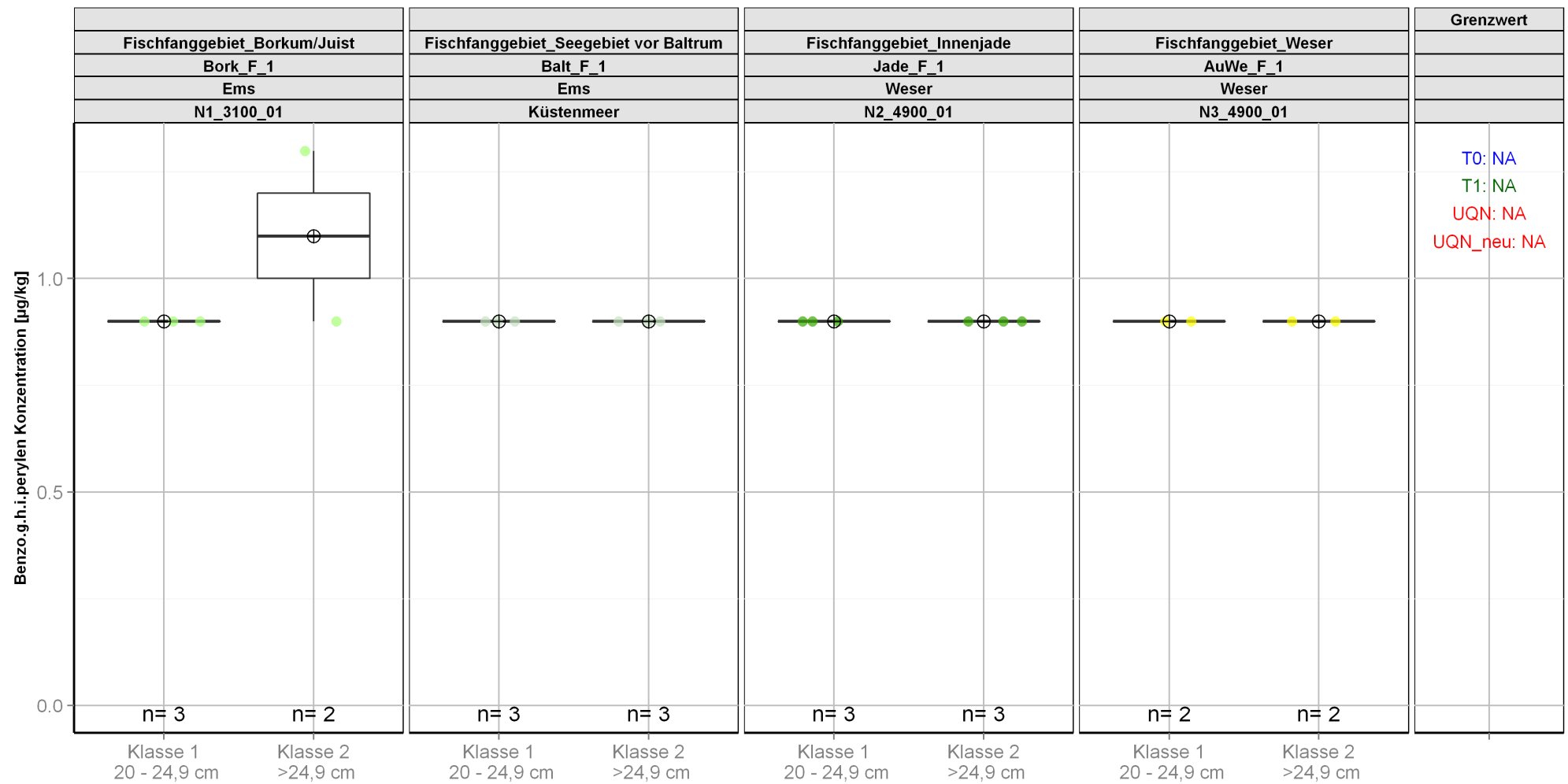
8.2 Biota



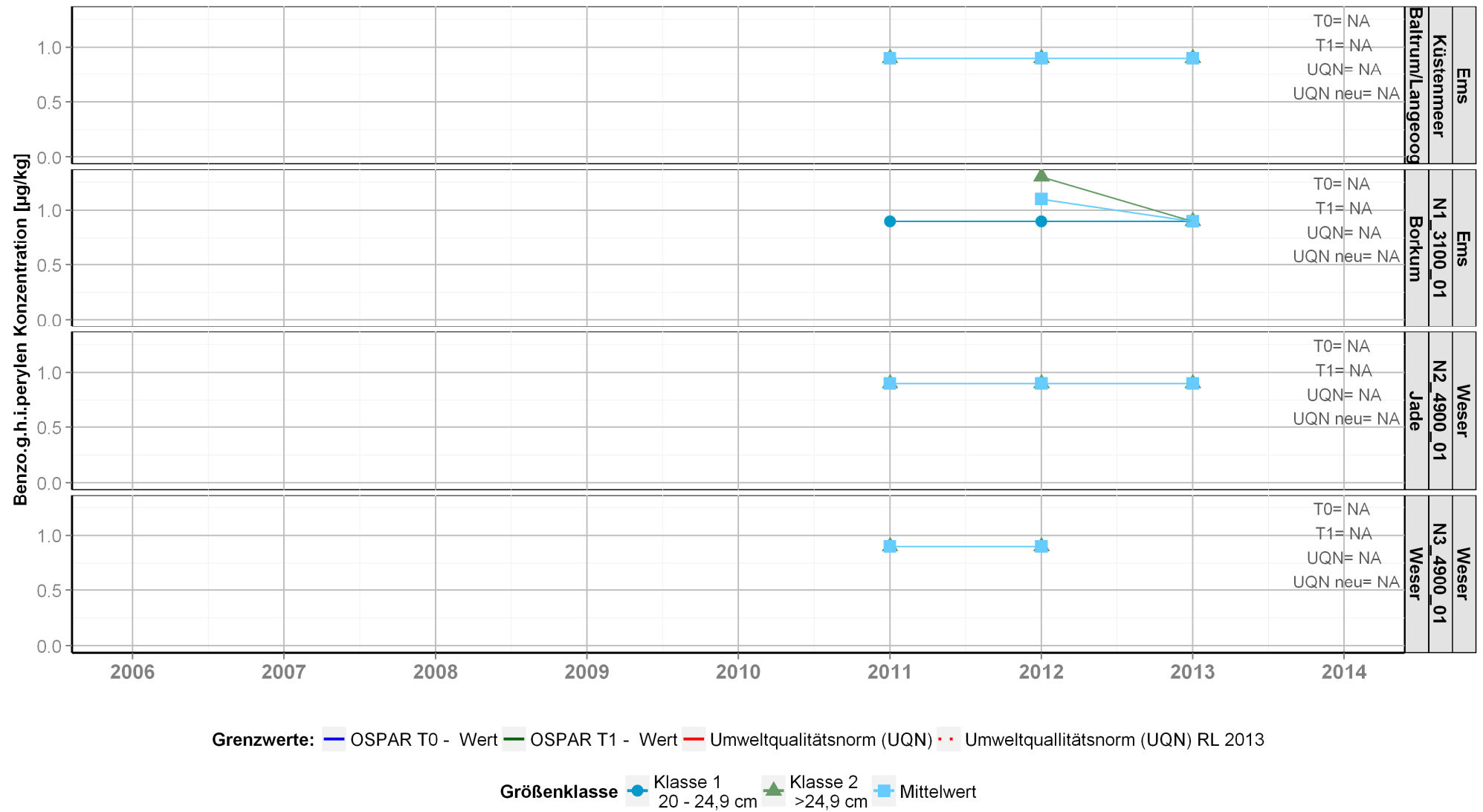




Bestimmungsgrenze: 1,3 µg/kg



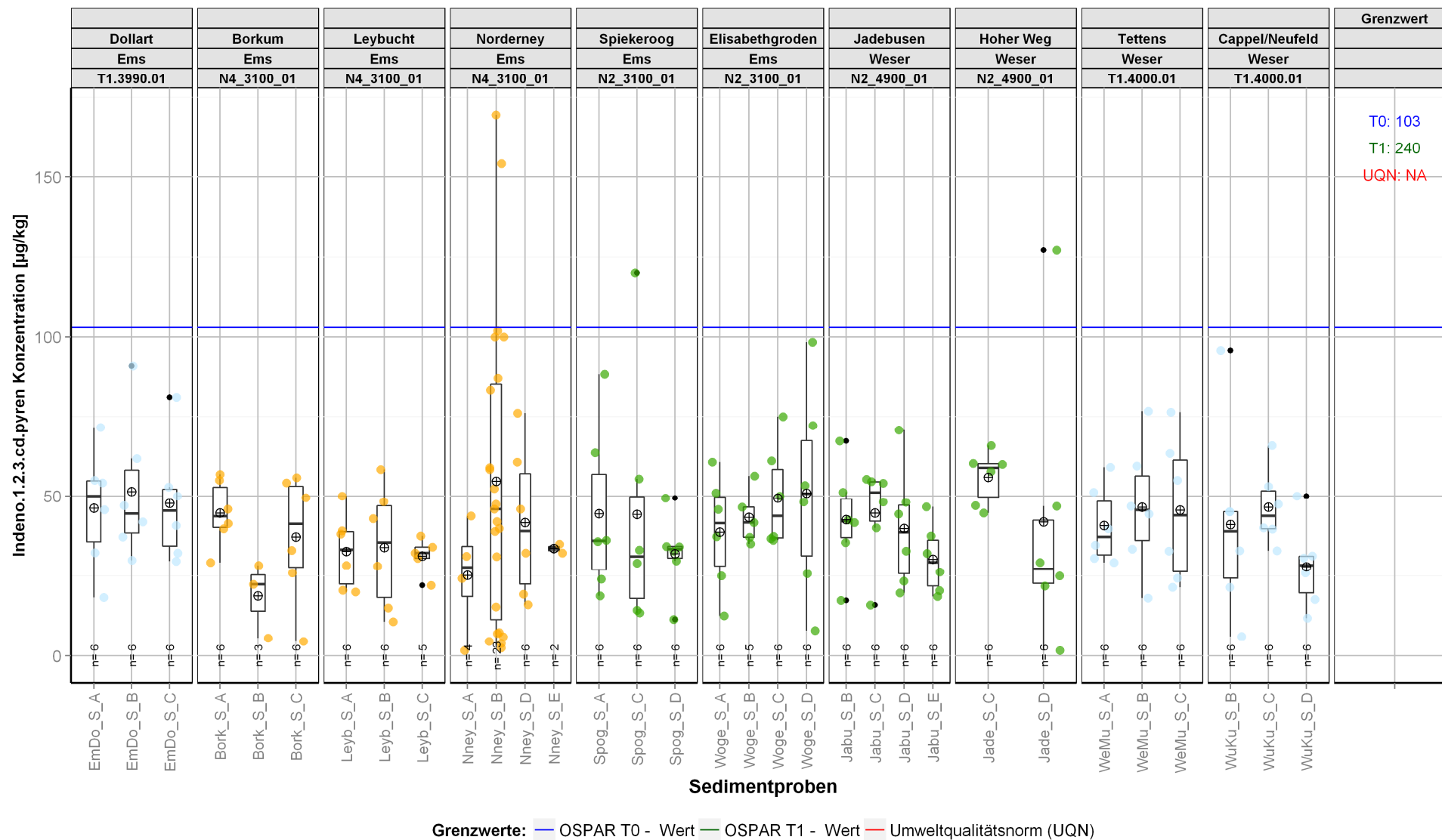
Grenzwerte: — OSPAR T0 - Wert — OSPAR T1 - Wert — Umweltqualitätsnorm (UQN) - - - Umweltqualitätsnorm (UQN) RL 2013

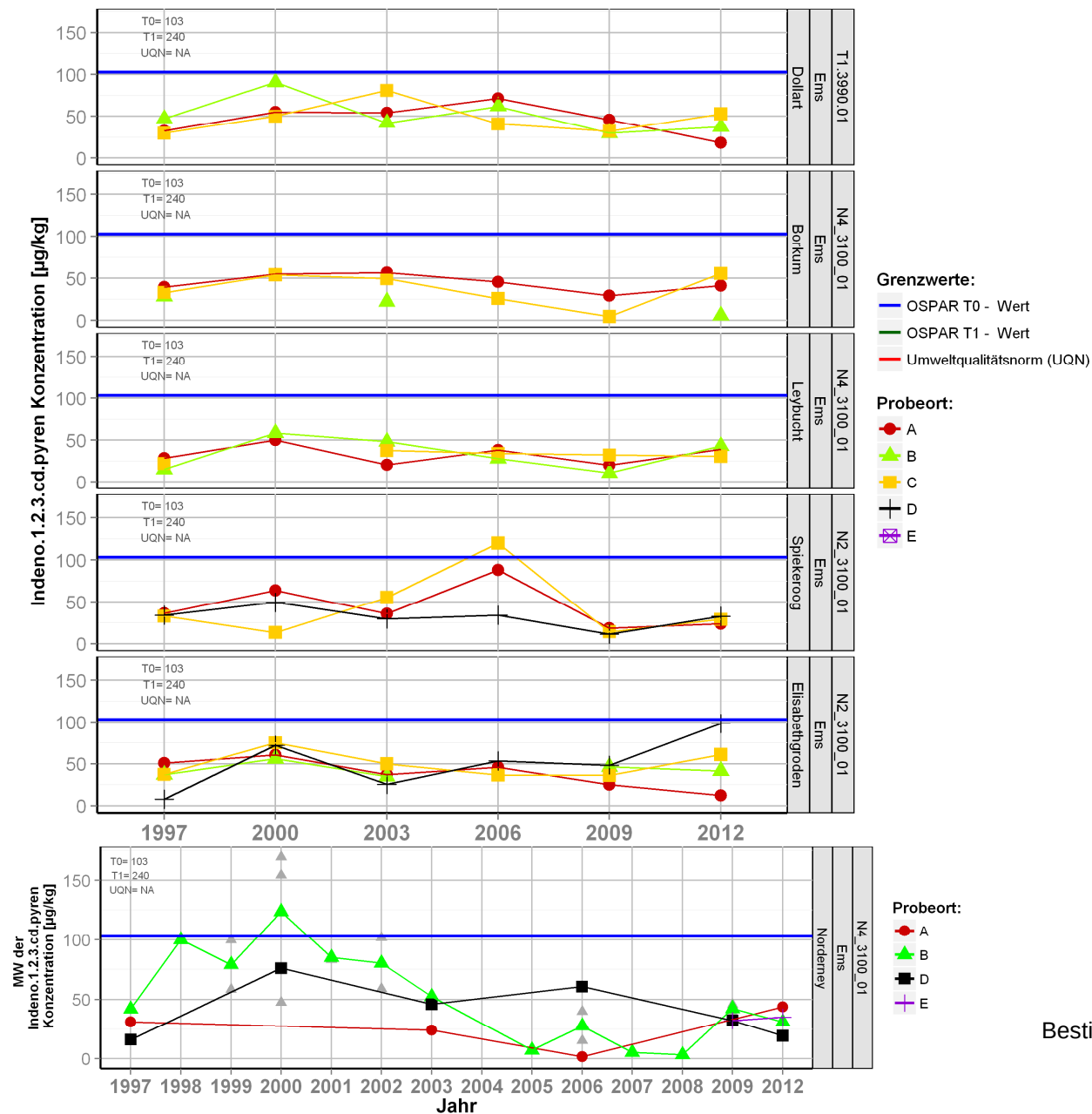


Bestimmungsgrenze: 2011-2013: 1,8 µg/kg

9. Indeno(1,2,3-cd)pyren

9.1 Sediment

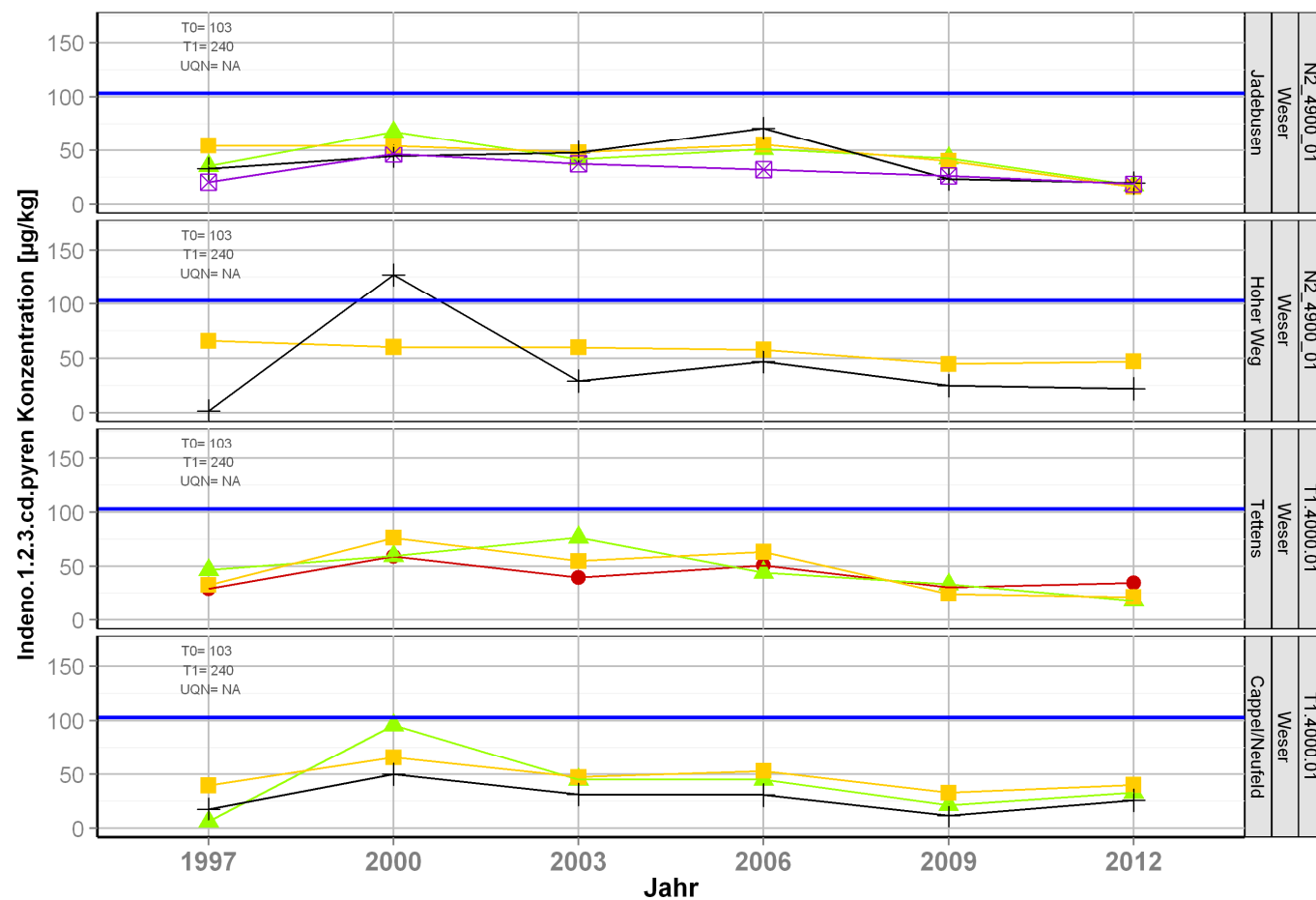




Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	→
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	→
Leyb_S_C	→
Spog_S_A	→
Spog_S_C	→
Woge_S_A	↓
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	→
Nney_S_D	→

Bestimmungsgrenze 2006/2009: 1 µg/kg

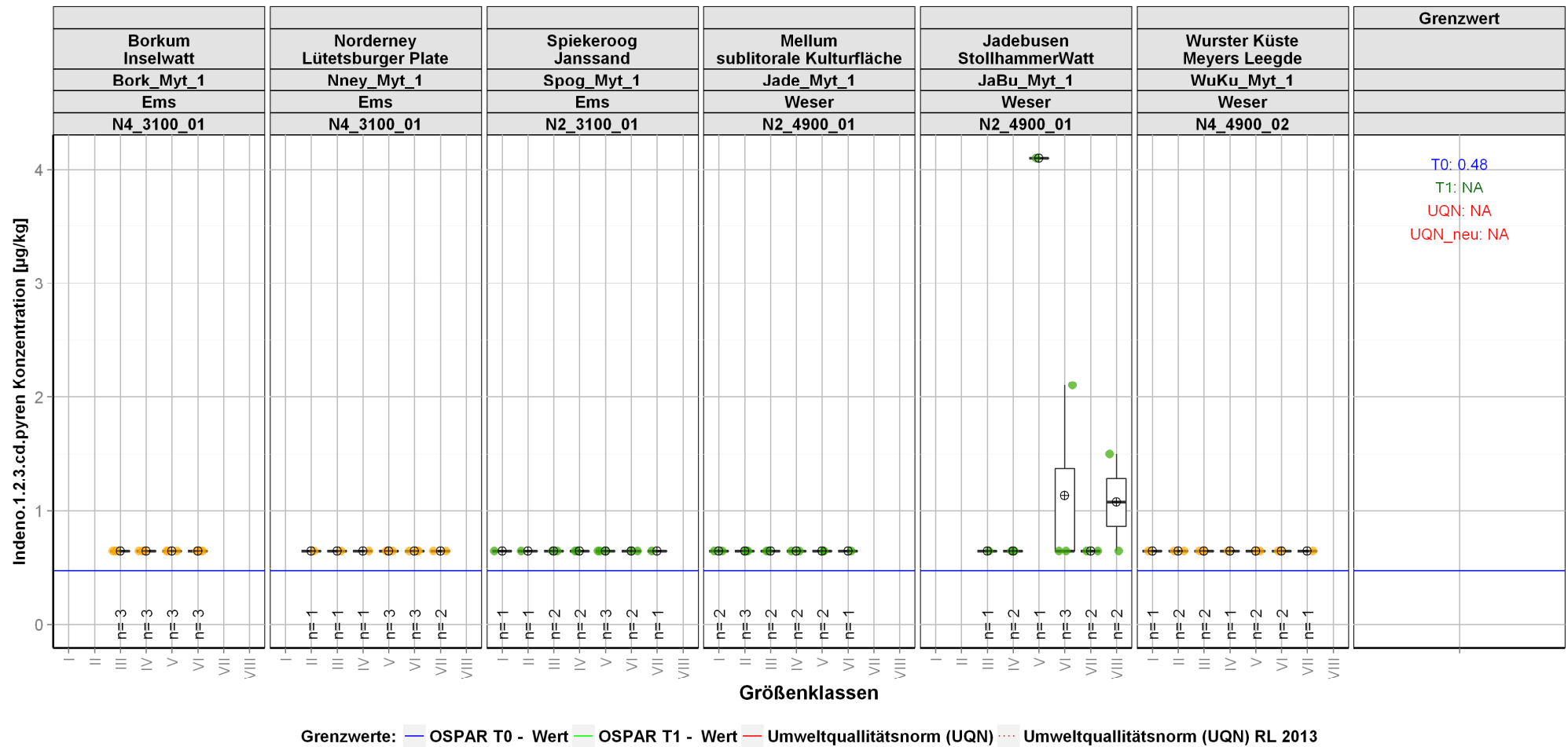


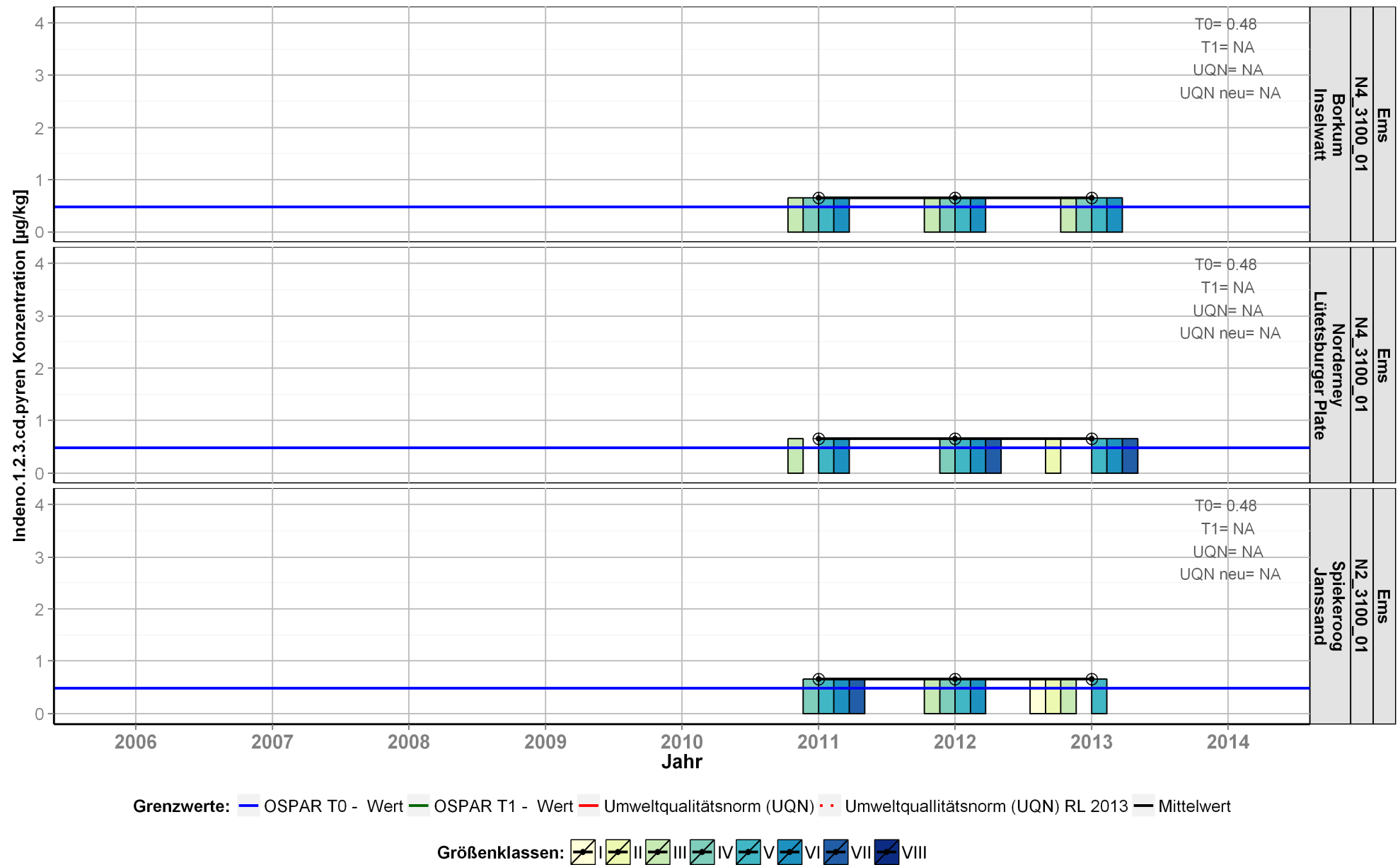


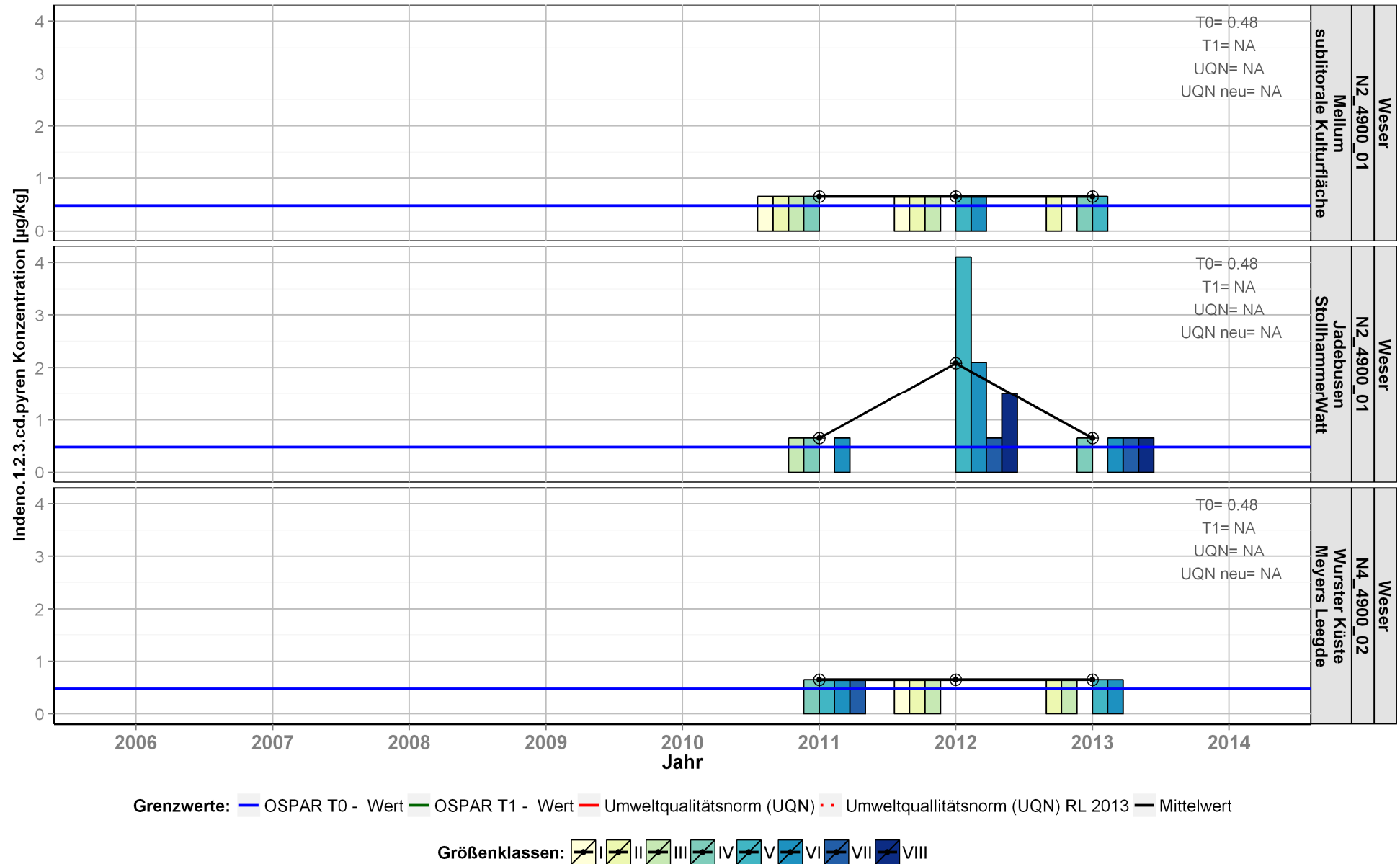
Station	Trend
Jabu_S_B	→
Jabu_S_C	→
Jabu_S_D	→
Jabu_S_E	→
Jade_S_C	↓
Jade_S_D	↓
WeMu_S_A	→
WeMu_S_B	→
WeMu_S_C	→
WuKu_S_B	→
WuKu_S_C	→
WuKu_S_D	→



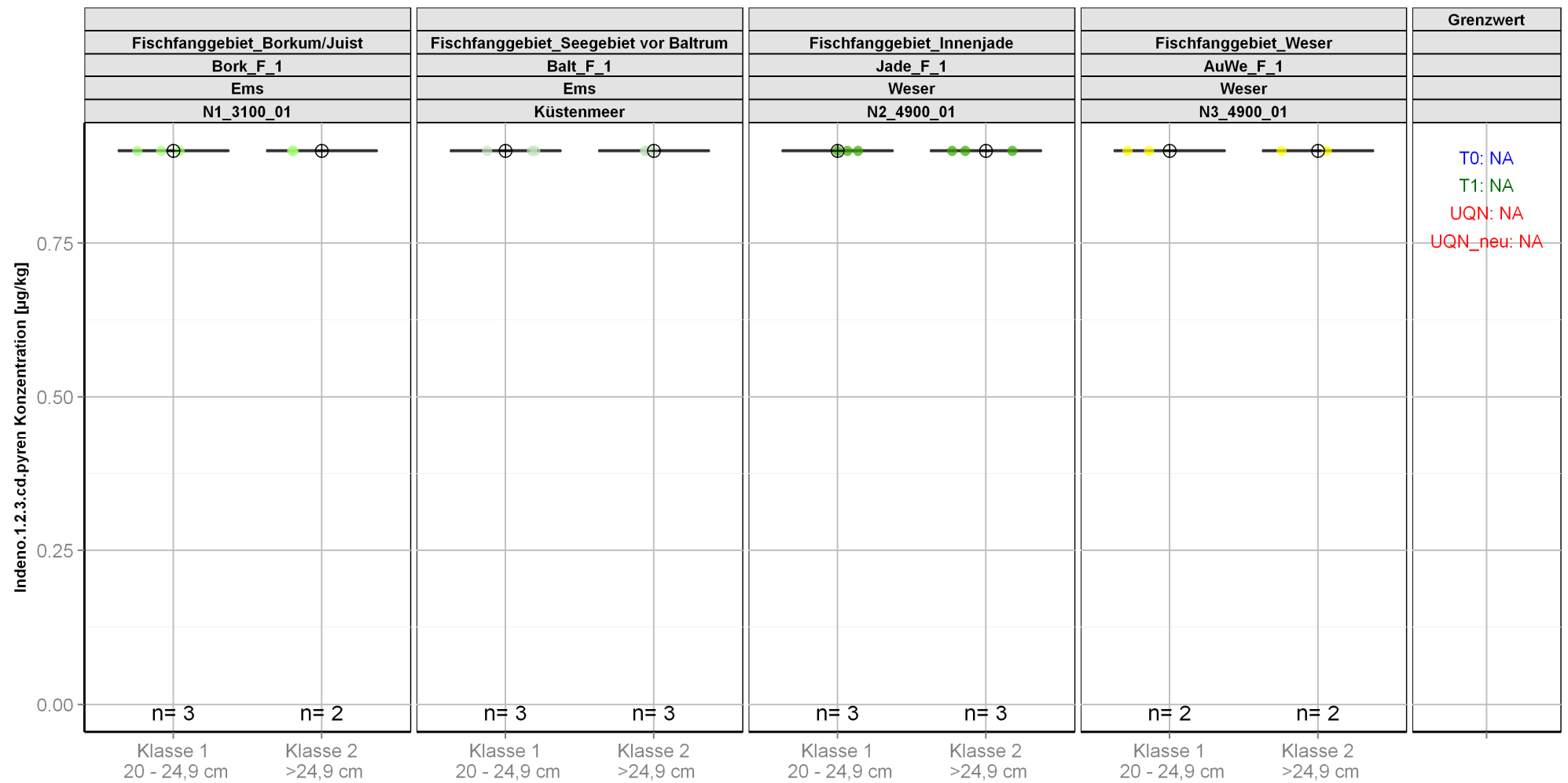
9.2 Biota





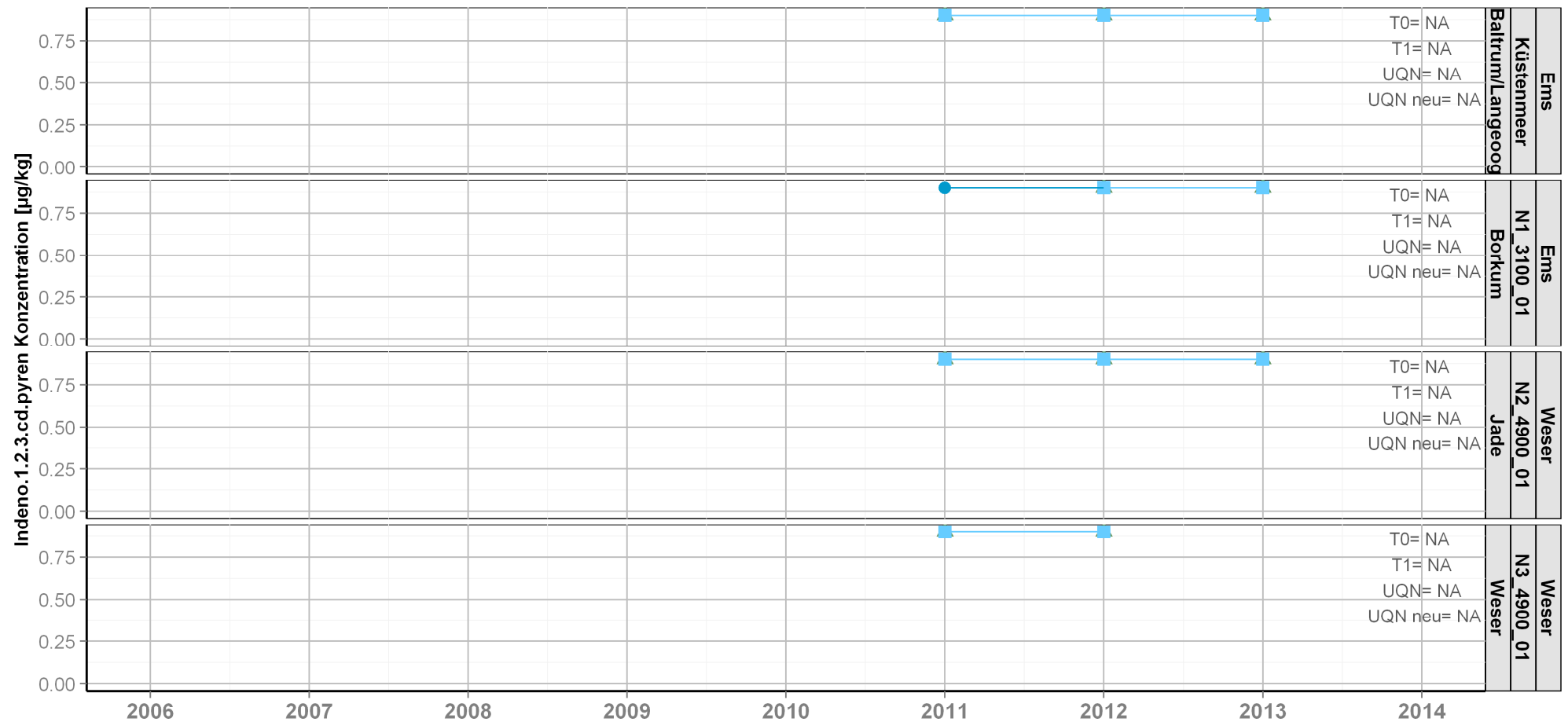


Bestimmungsgrenze: 1,3 µg/kg



Grenzwerte: — OSPAR T0 - Wert — OSPAR T1 - Wert — Umweltqualitätsnorm (UQN) - - Umweltqualitätsnorm (UQN) RL 2013





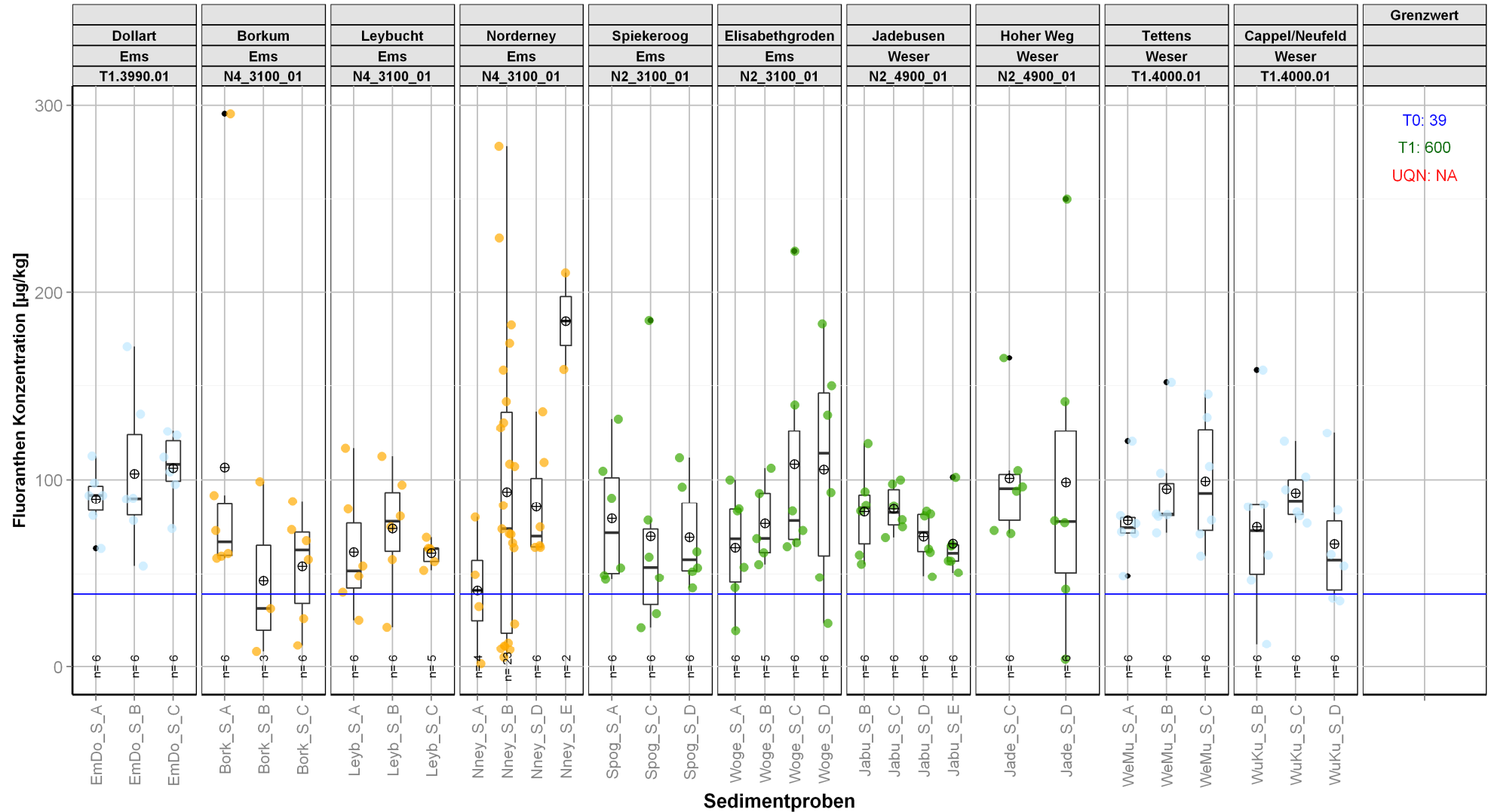
Grenzwerte: OSPAR T0 - Wert OSPAR T1 - Wert Umweltqualitätsnorm (UQN) Umweltqualitätsnorm (UQN) RL 2013

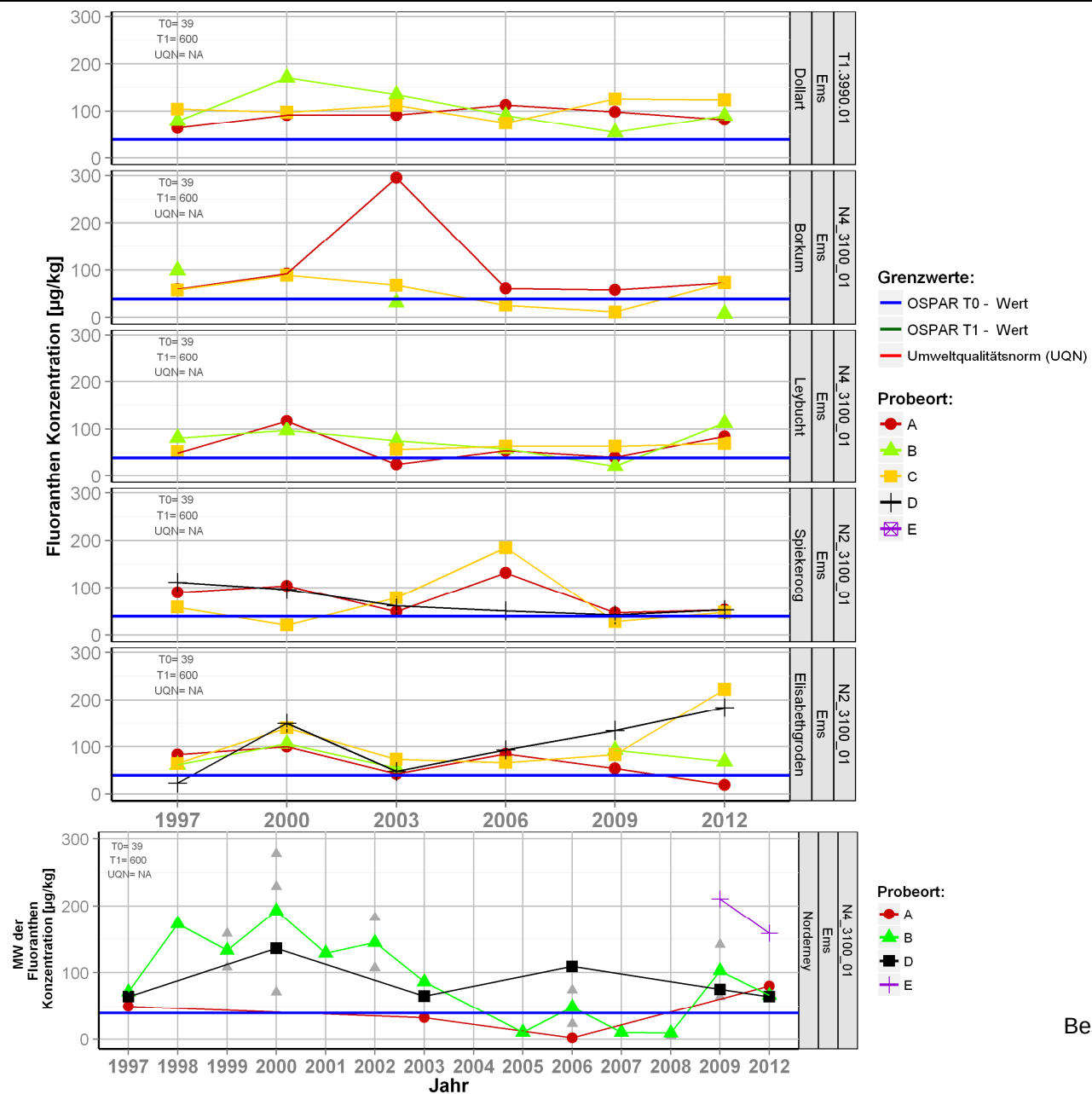
Größenklasse Klasse 1 20 - 24,9 cm Klasse 2 >24,9 cm Mittelwert

Bestimmungsgrenze: 2011-2013: 1,8 µg/kg

10. Fluoranthen

10.1 Sediment

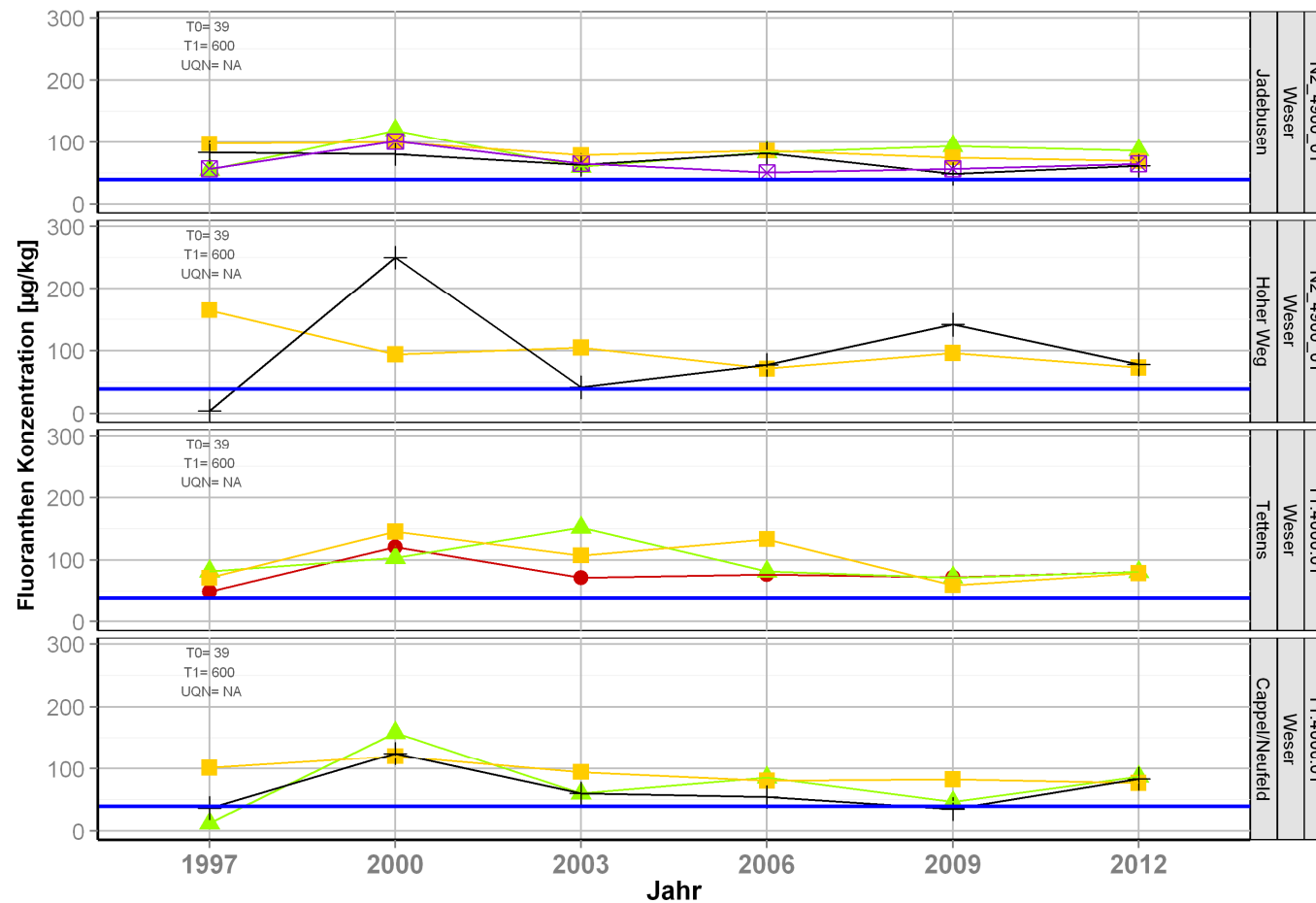




Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	→
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	→
Leyb_S_C	→
Spog_S_A	→
Spog_S_C	→
Woge_S_A	→
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	→
Nney_S_D	→

Bestimmungsgrenze 2006: 1 µg/kg

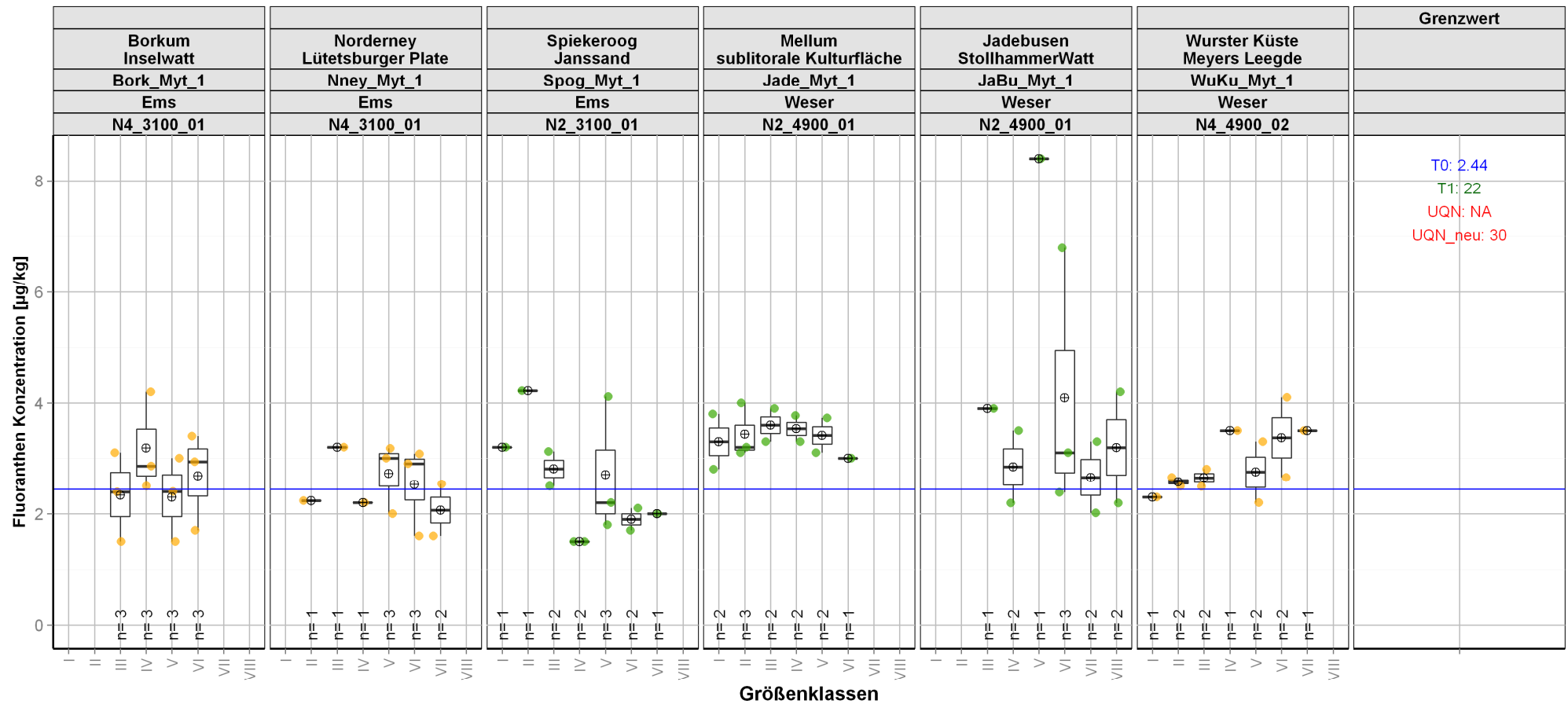


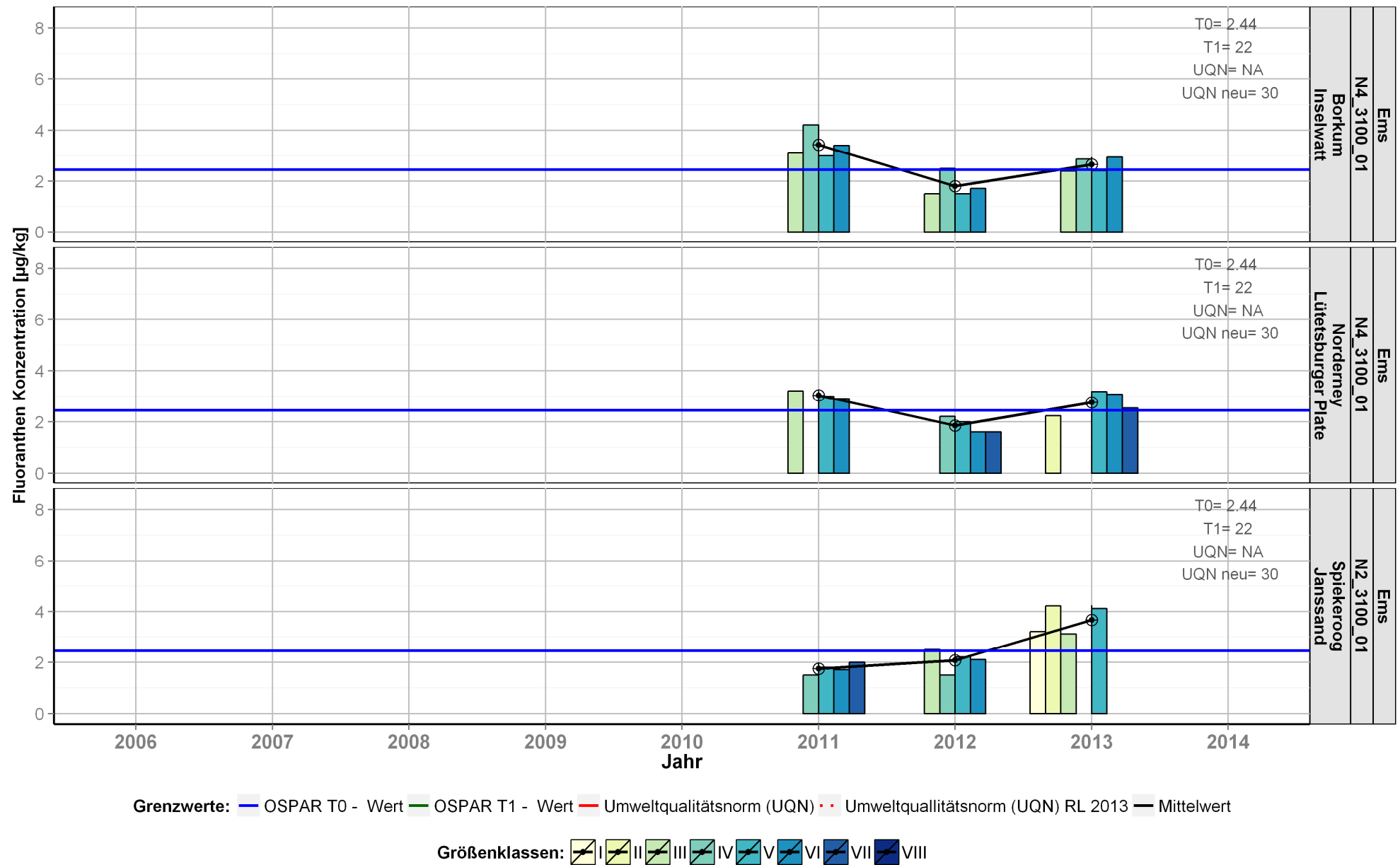


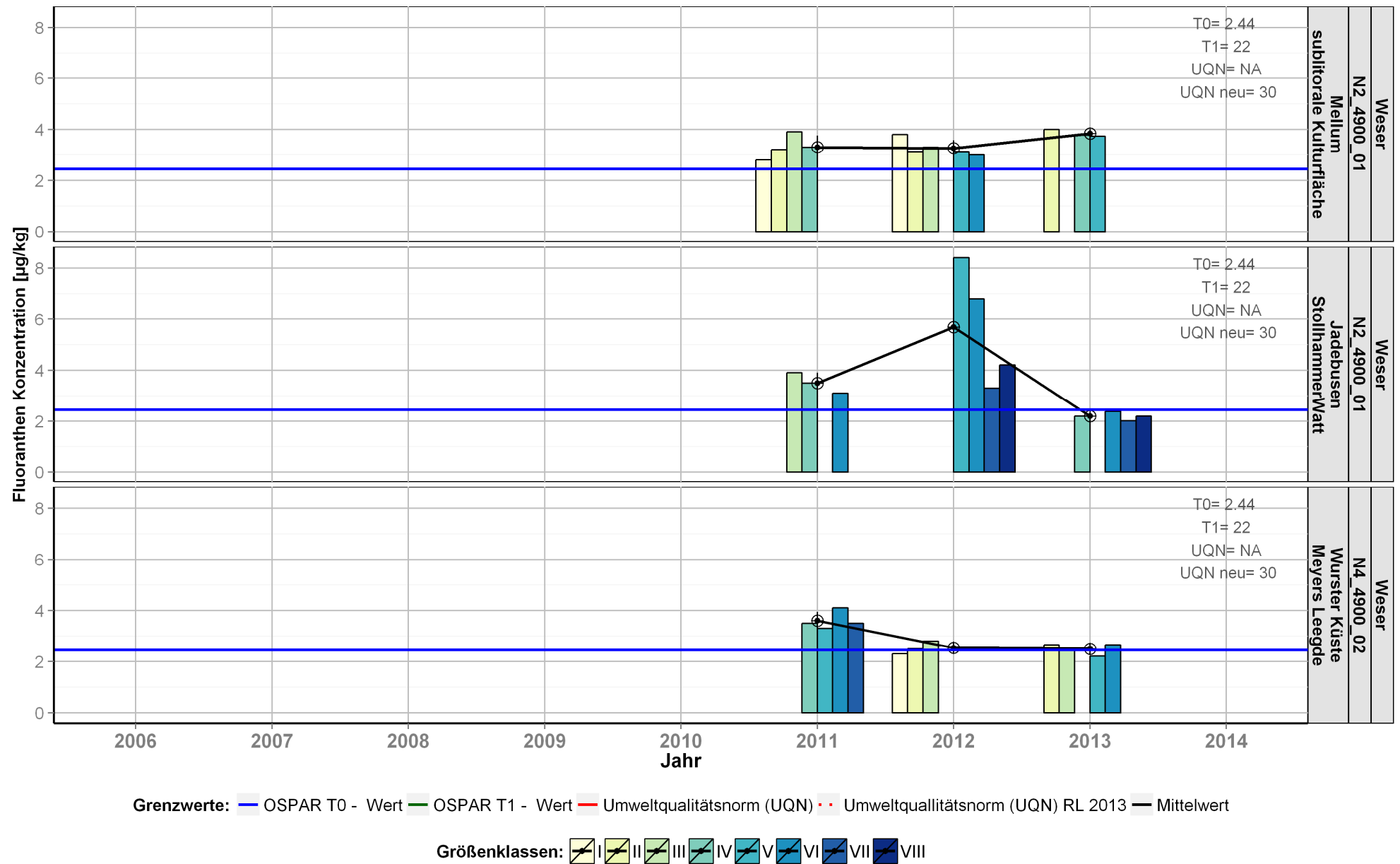
Station	Trend
Jabu_S_B	→
Jabu_S_C	↓
Jabu_S_D	→
Jabu_S_E	→
Jade_S_C	→
Jade_S_D	→
WeMu_S_A	→
WeMu_S_B	→
WeMu_S_C	→
WuKu_S_B	→
WuKu_S_C	↓
WuKu_S_D	→

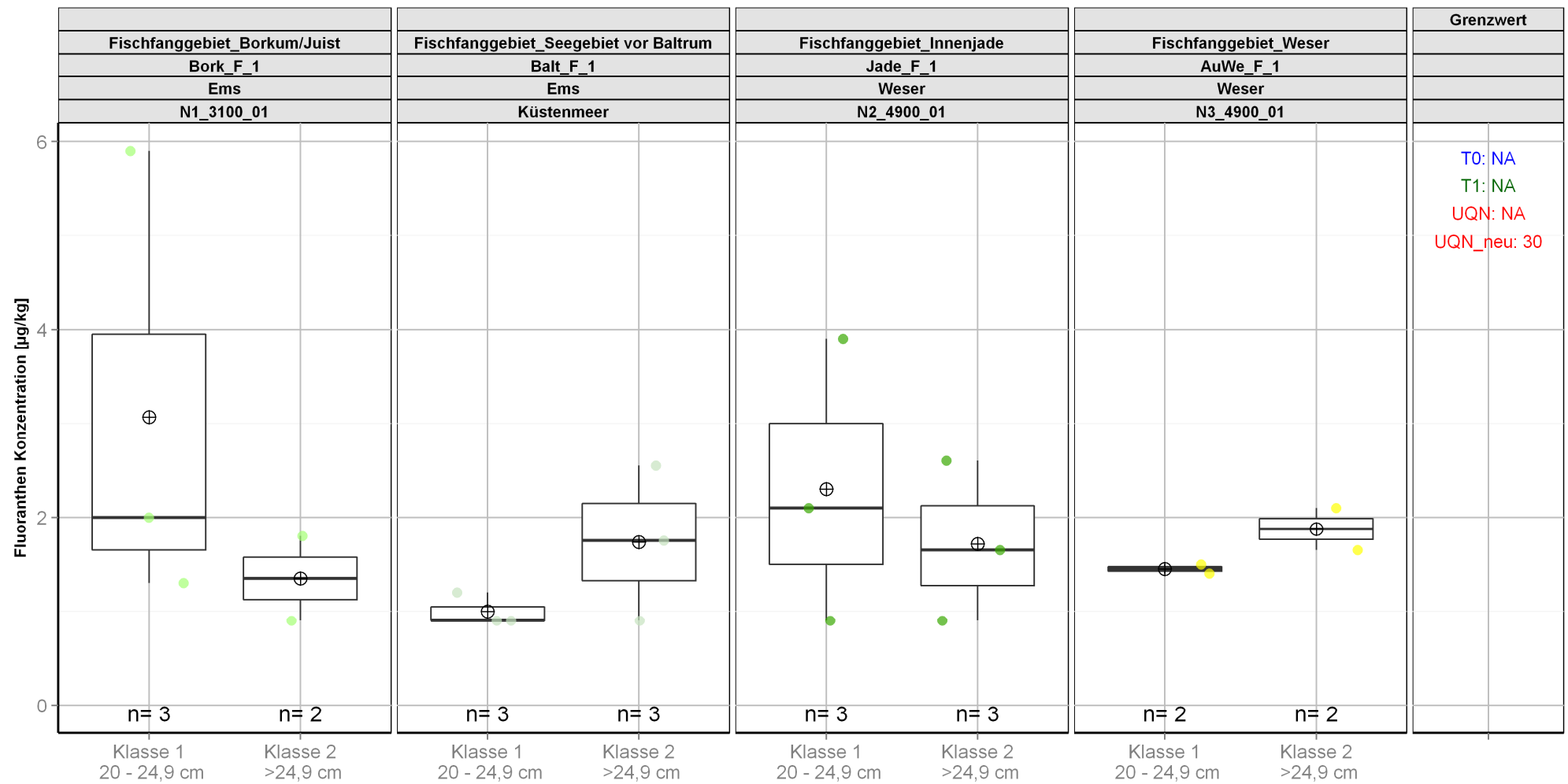


10.2 Biota



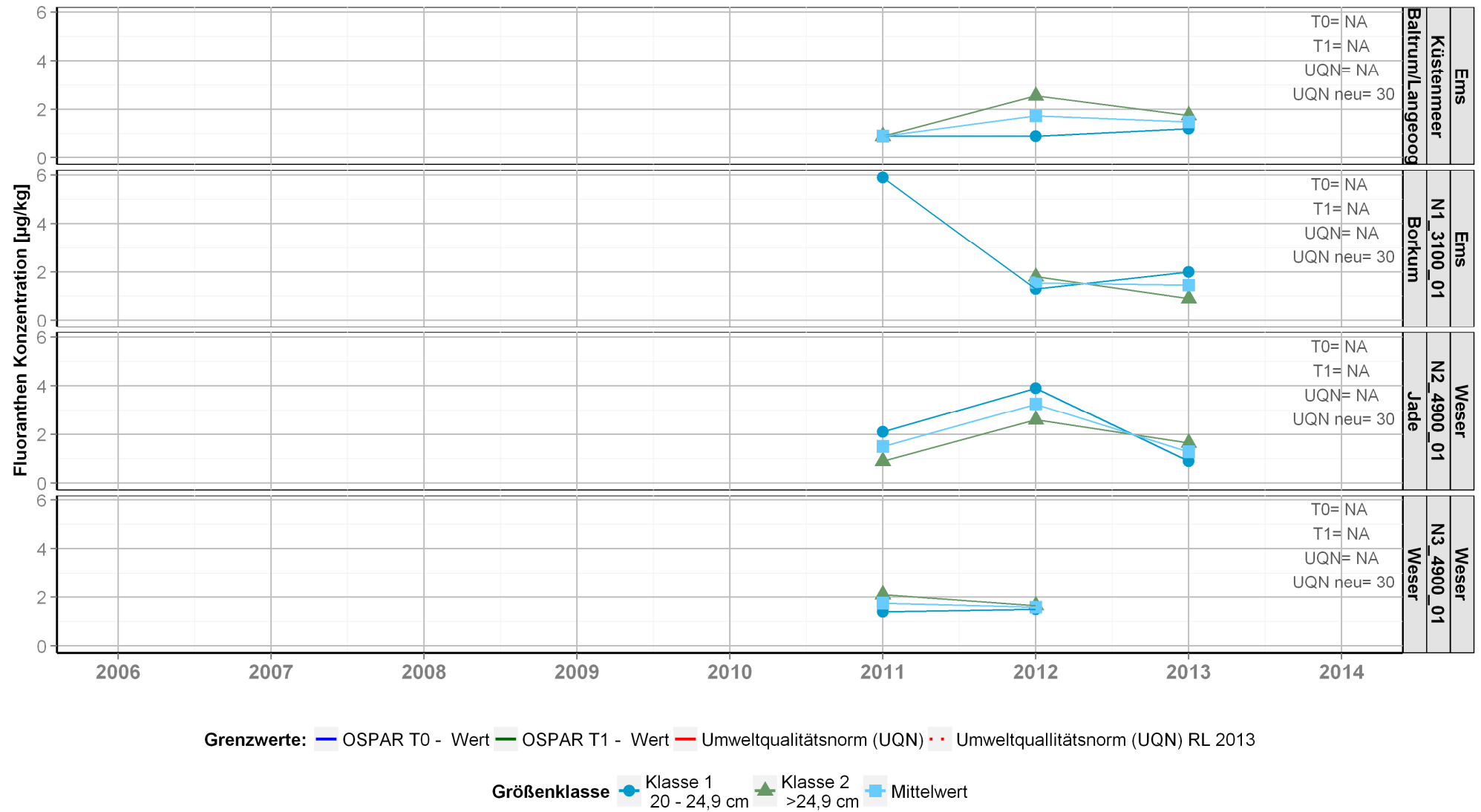






Grenzwerte: — OSPAR T0 - Wert — OSPAR T1 - Wert — Umweltqualitätsnorm (UQN) - - Umweltqualitätsnorm (UQN) RL 2013

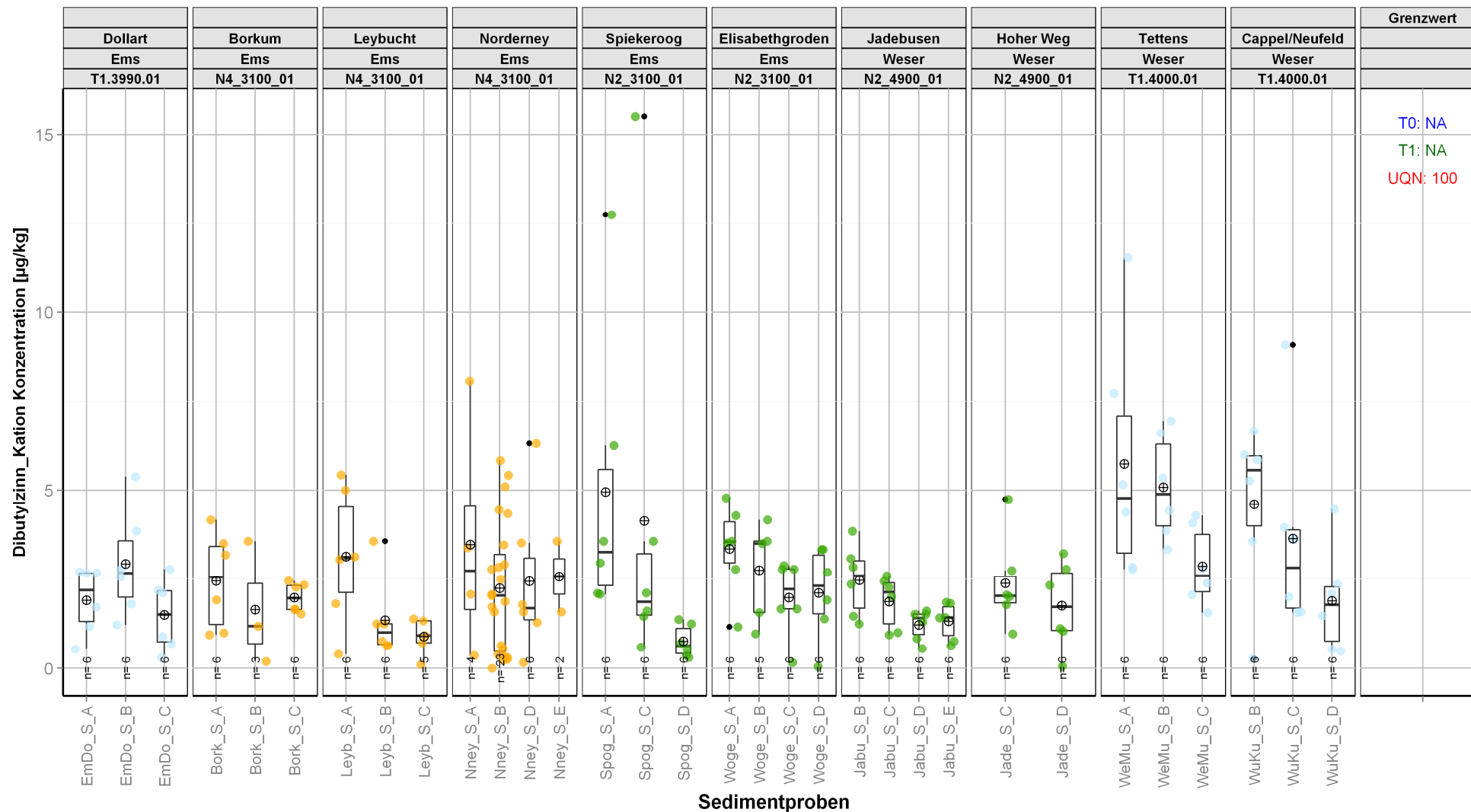


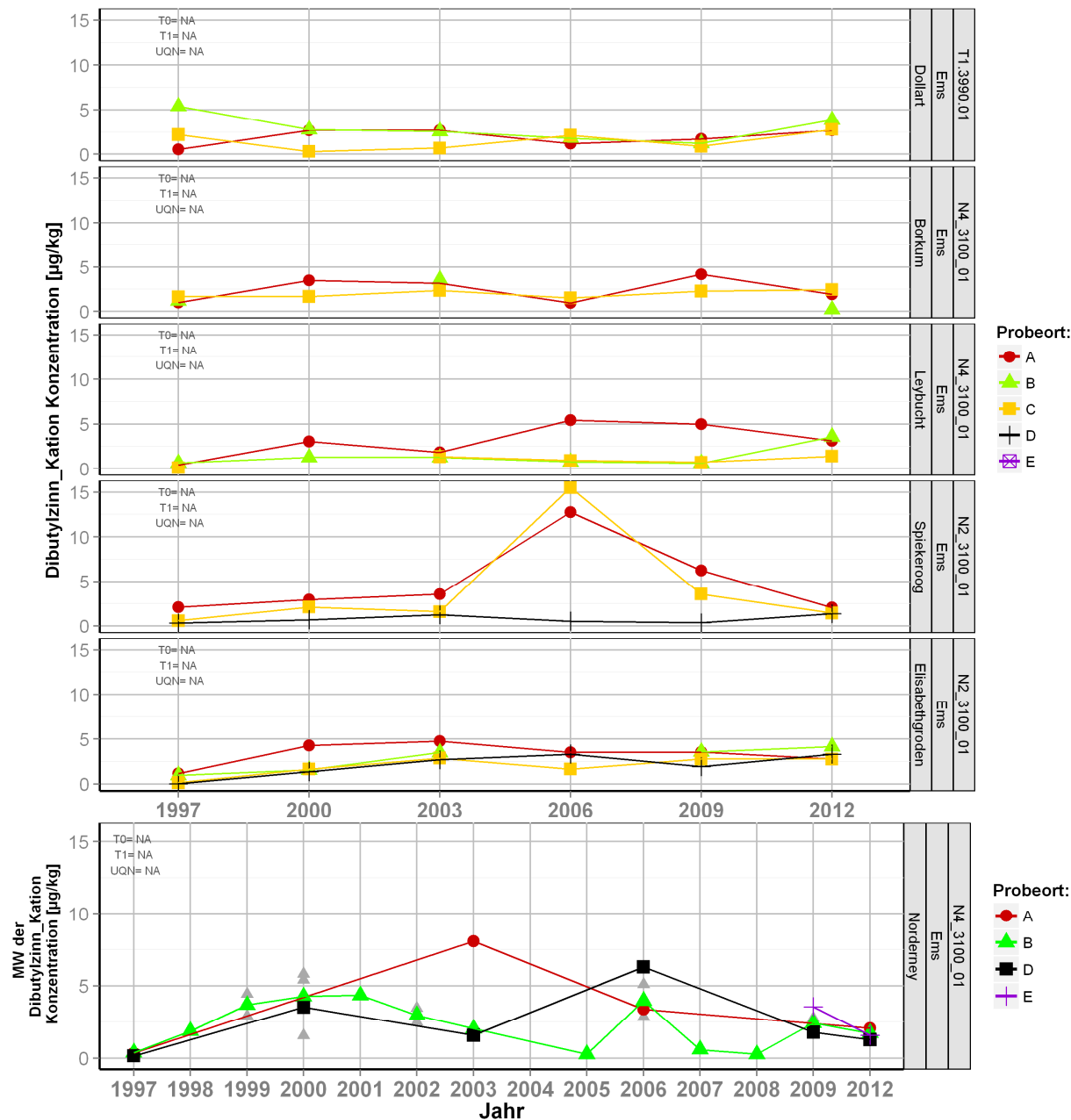


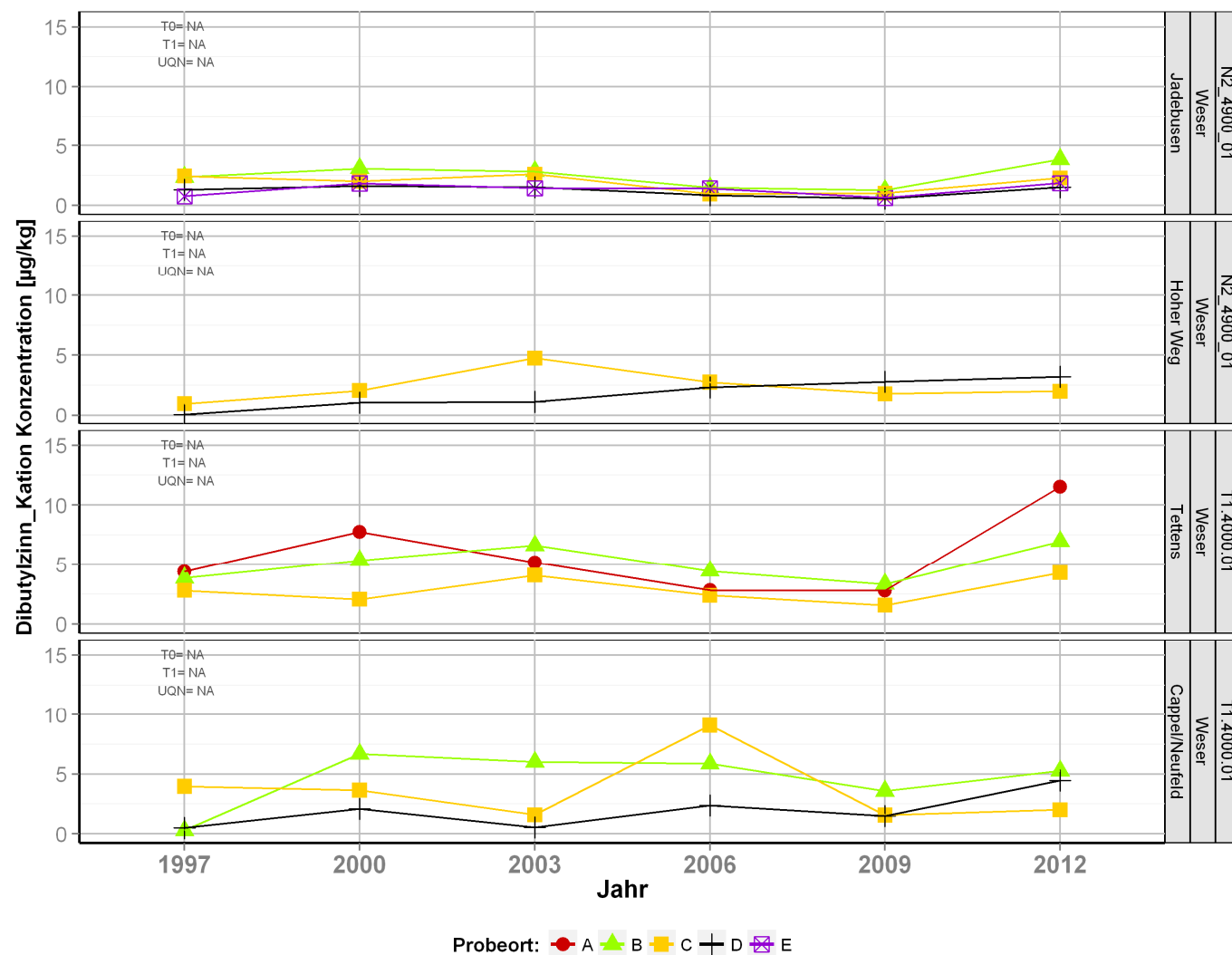
Bestimmungsgrenze: 2011-2013: 1,8 µg/kg

11. Dibutylzinn-Kation

11.1 Sediment

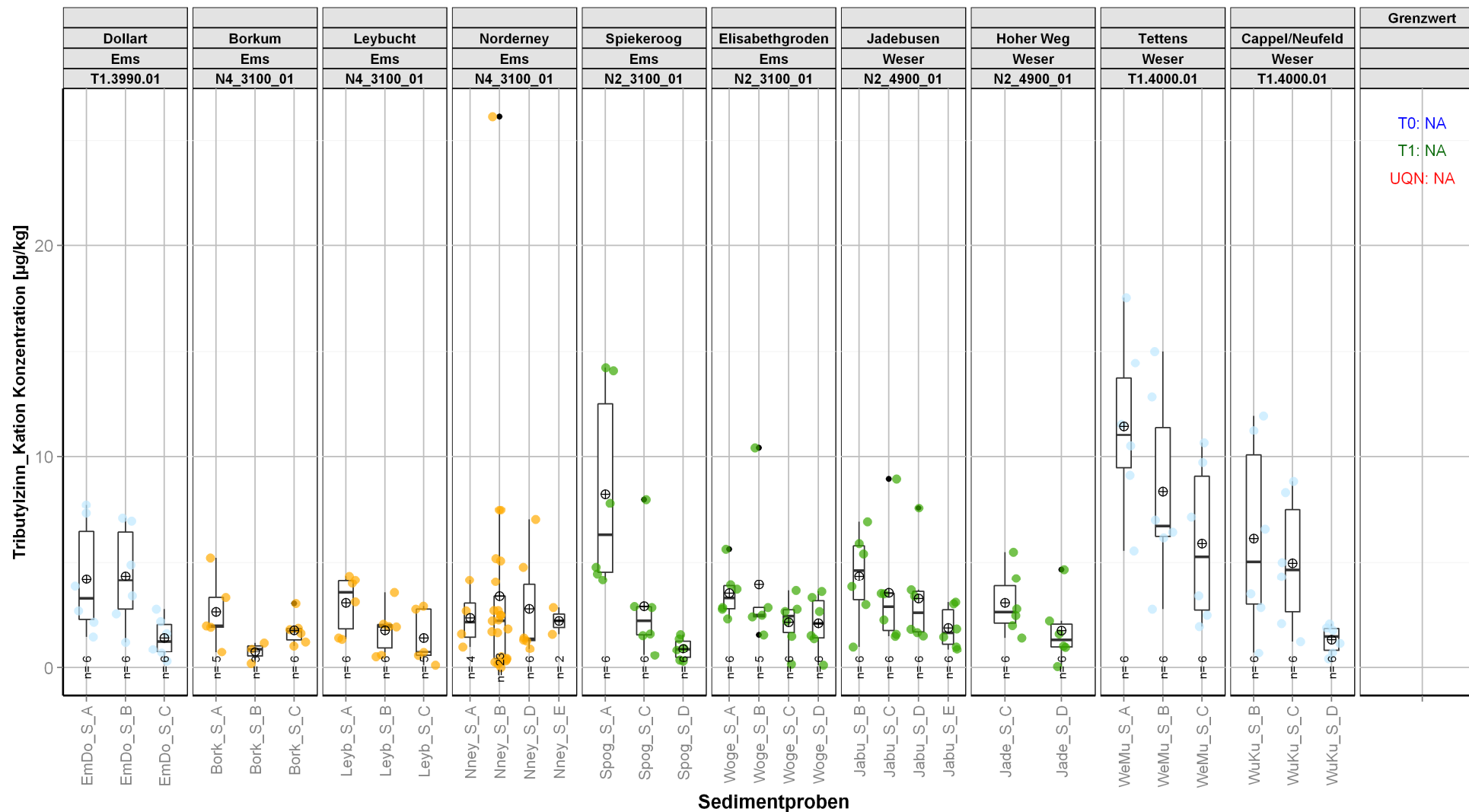


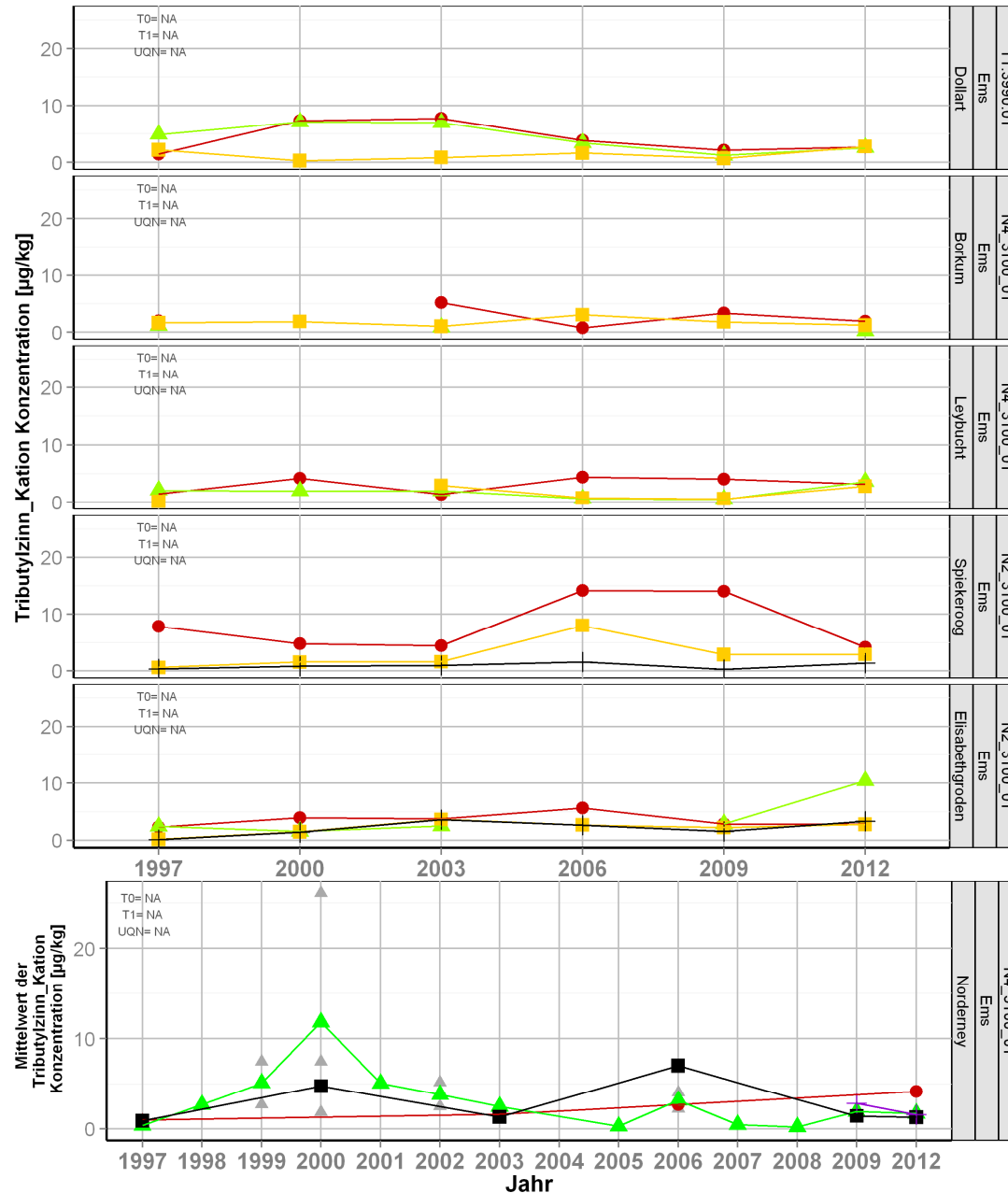




12. Tributylzinn-Kation

12.1 Sediment

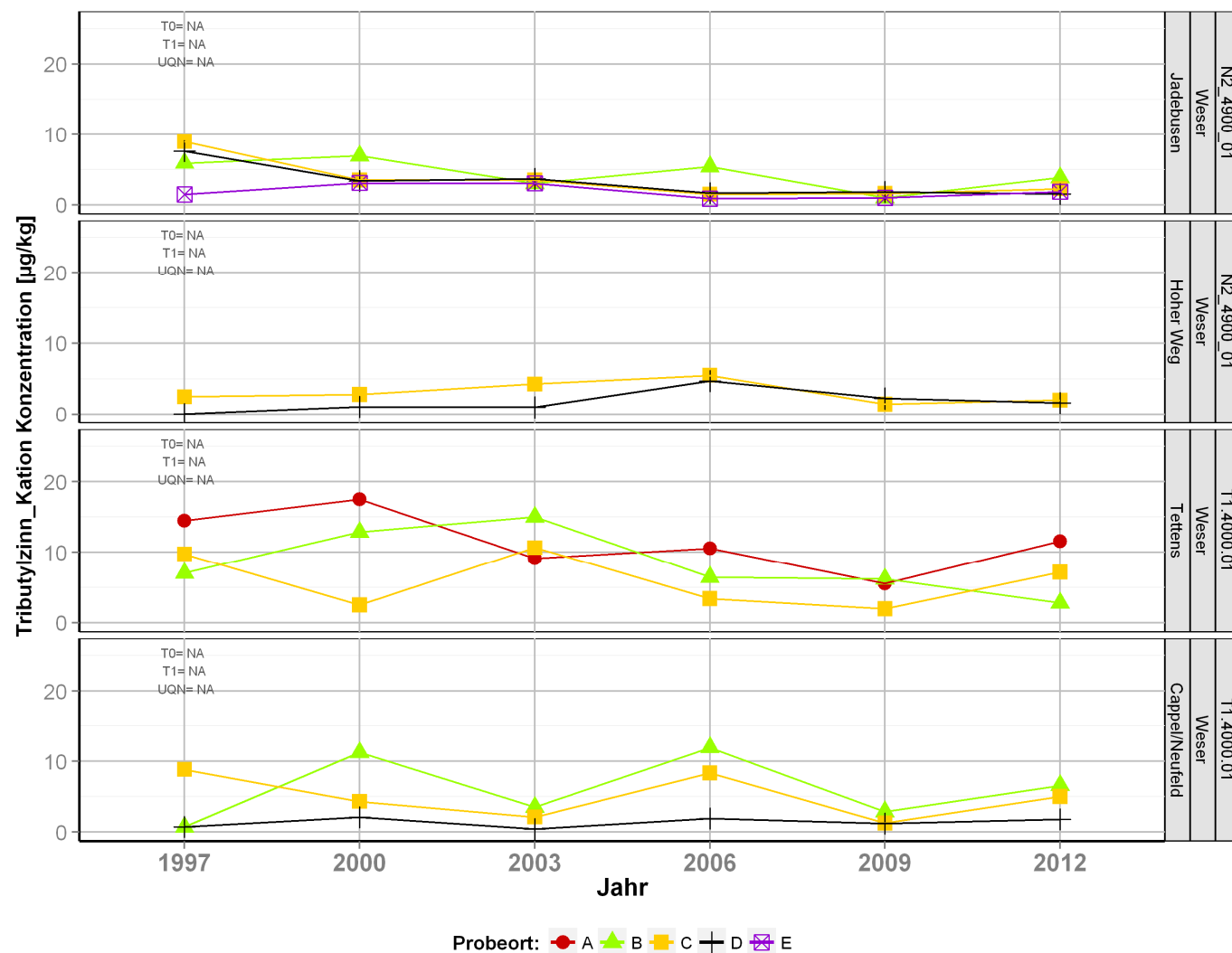




Station	Trend
EmDo_S_A	→
EmDo_S_B	→
EmDo_S_C	→
Bork_S_A	→
Bork_S_B	→
Bork_S_C	→
Leyb_S_A	→
Leyb_S_B	→
Leyb_S_C	→
Spog_S_A	→
Spog_S_C	↑
Woge_S_A	→
Woge_S_B	→
Woge_S_C	→
Woge_S_D	→
Nney_S_B	→
Nney_S_D	→

Bestimmungsgrenzen:

1997: 0,5; 2000: 1,0; 2003: 0,4; 2005: 2,0; 2006-2009: 1,6;
2012: 4,0 µg/kg

Station	Trend
Jabu_S_B	→
Jabu_S_C	→
Jabu_S_D	↓
Jabu_S_E	→
Jade_S_C	→
Jade_S_D	→
WeMu_S_A	→
WeMu_S_B	→
WeMu_S_C	→
WuKu_S_B	→
WuKu_S_C	→
WuKu_S_D	→



13. Tetrabutylzinn

13.1 Sediment

