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Supplement of

Decoding pelagic ciliate (Ciliophora) community divergences in size spectrum, biodiversity and driving factors globally spanning five temperature zones

Chaofeng Wang et al.

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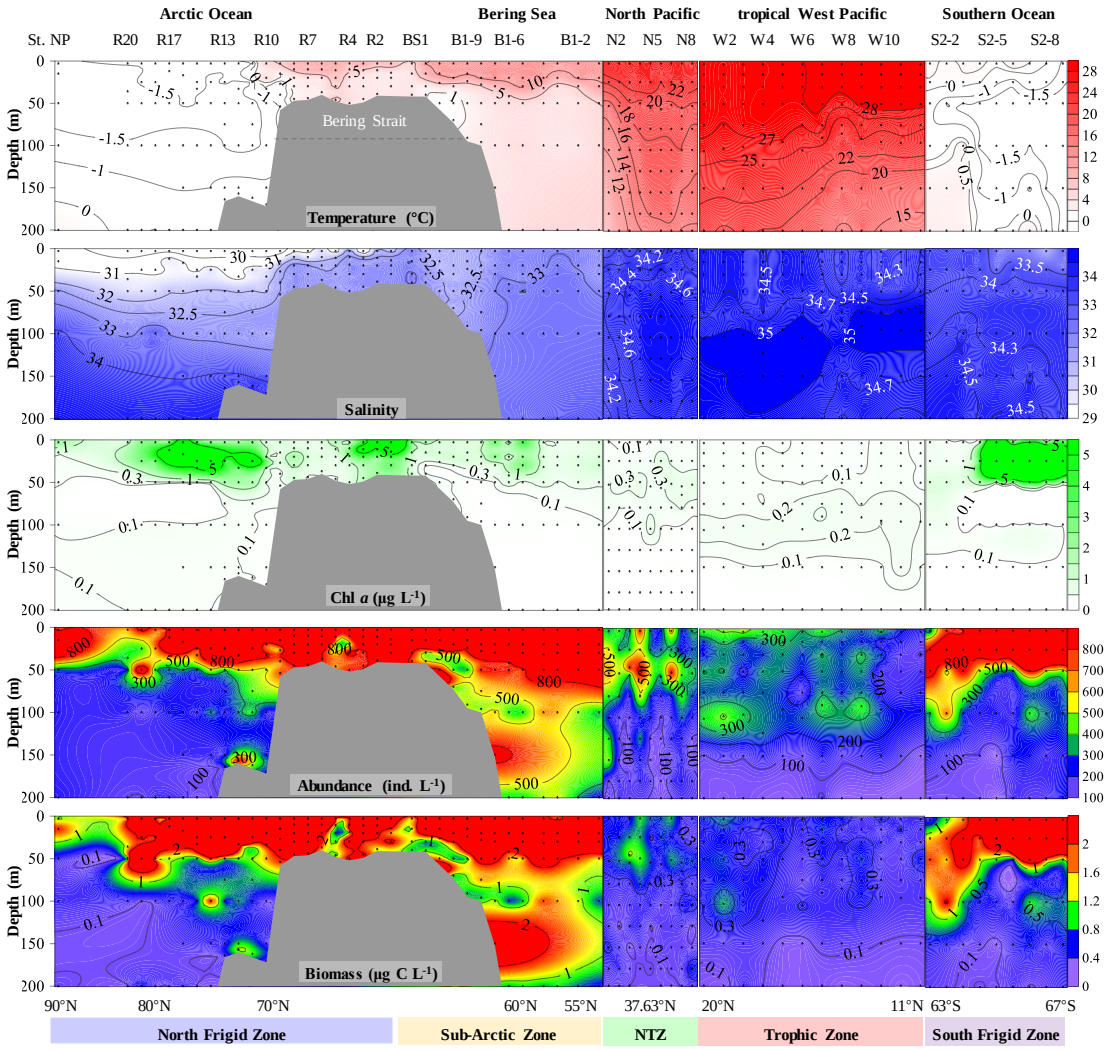

Figure S1. Profiles of temperature, salinity, chlorophyll *a* (Chl *a*), total ciliate abundance and biomass from the surface to bottom (or 200 m) in the Arctic Ocean, Bering Sea, North Pacific, tropical West Pacific and Southern Ocean.

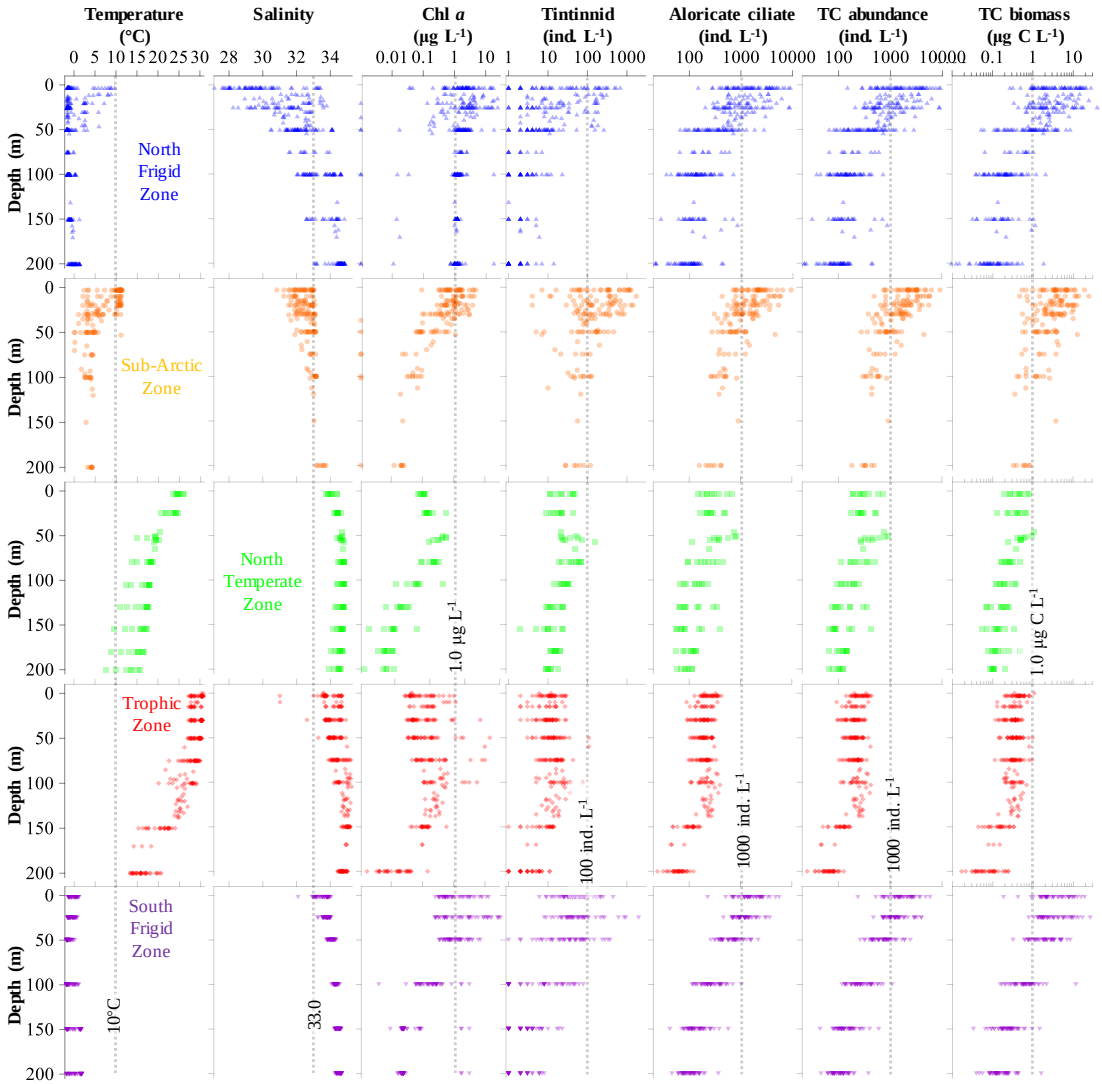

Figure S2. Profiles of temperature, salinity, chlorophyll *a* (Chl *a*), tintinnid, aloricate ciliate and total ciliate (TC) abundance and biomass from the surface to bottom (or 200 m) in each temperature zone.

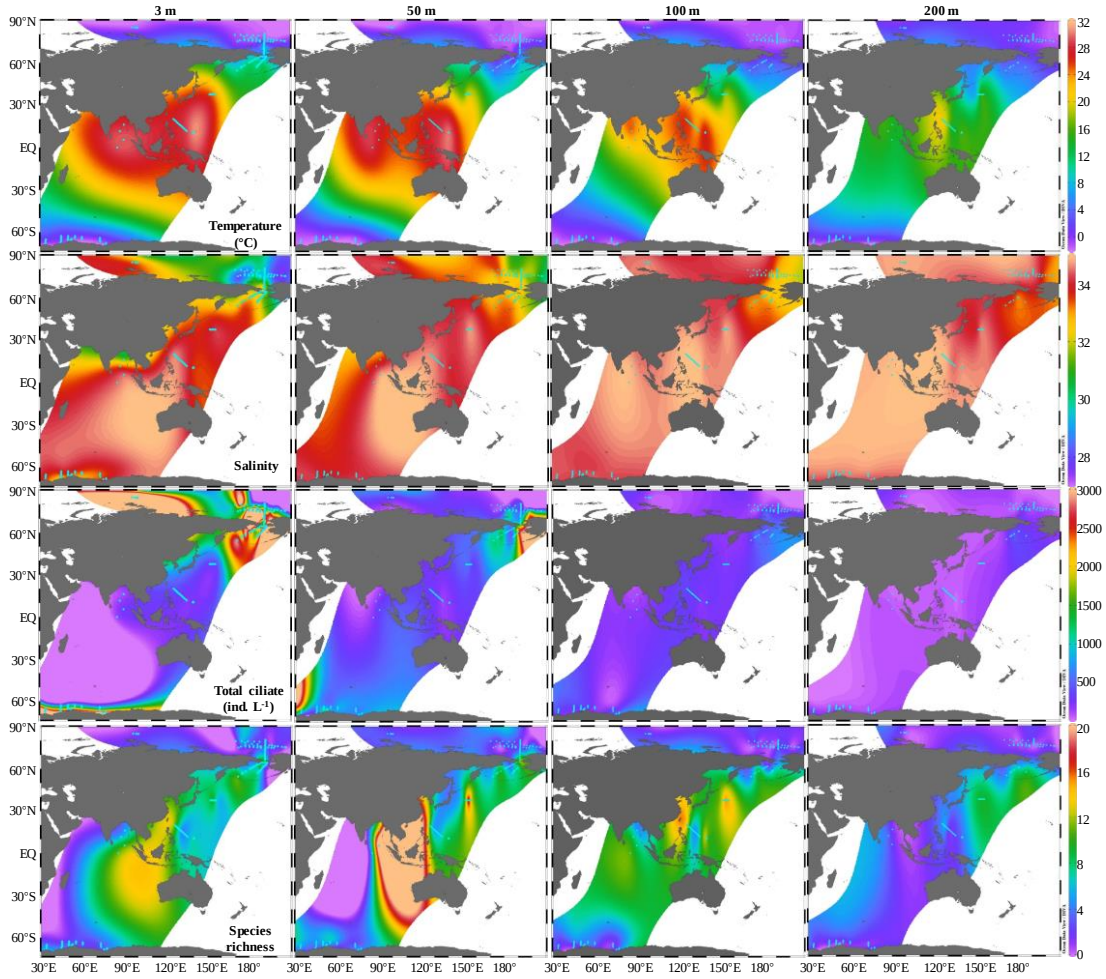

Figure S3. Horizontal distribution of temperature, salinity, total ciliate abundance and tintinnid species richness in global scale.

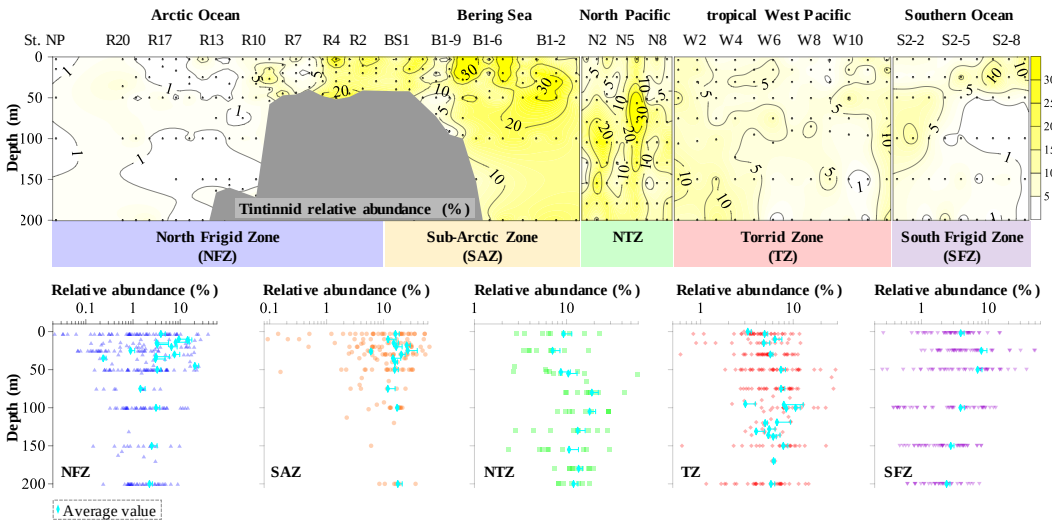

Figure S4. Profiles of tintinnid relative abundance from the surface to bottom (or 200 m) in five temperature zones.

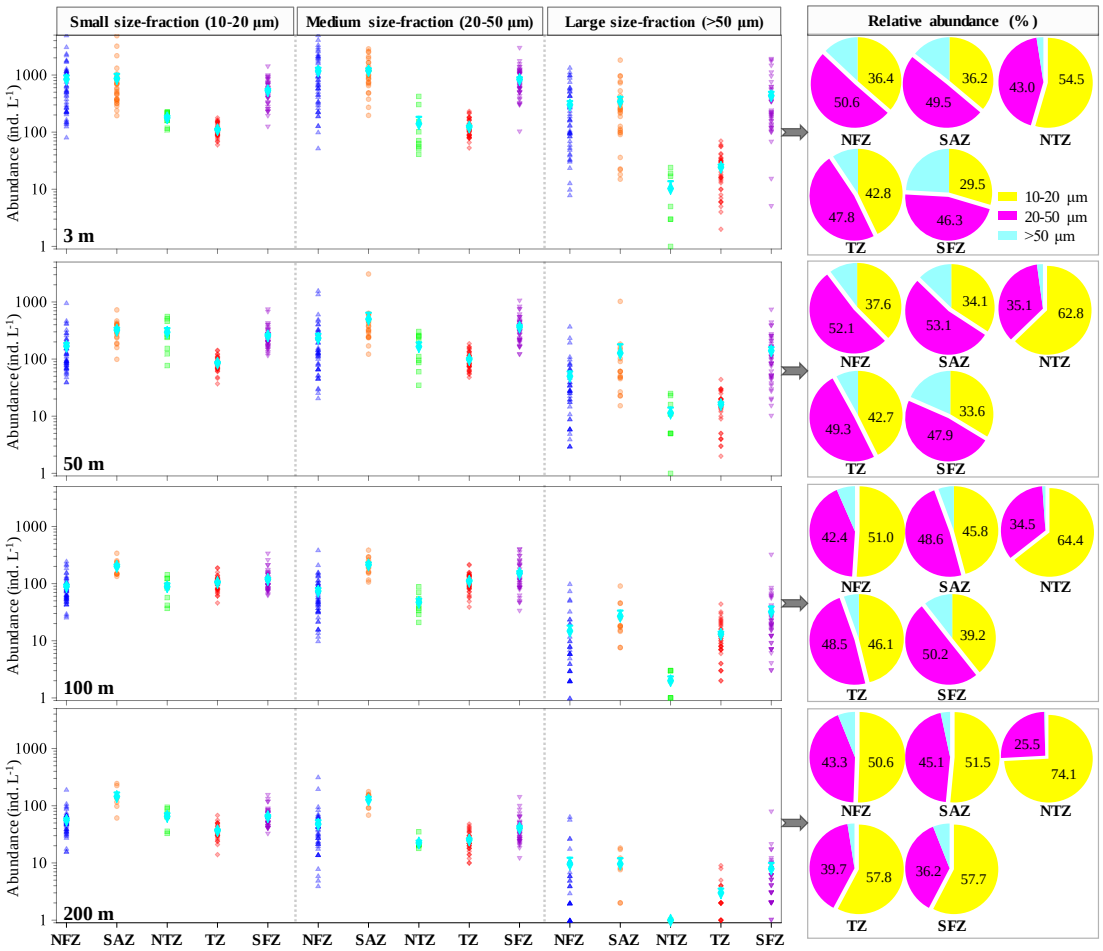

Figure S5. Horizontal distribution of aloricate ciliate small (10–20 µm)/medium (20–50 µm)/Large (>50 µm) size-fraction of at discrete depth of the North Frigid Zone (NFZ), sub-Arctic Zone (SAZ), North Temperate Zone (NTZ), Torrid Zone (TZ) and South Frigid Zone (SFZ).

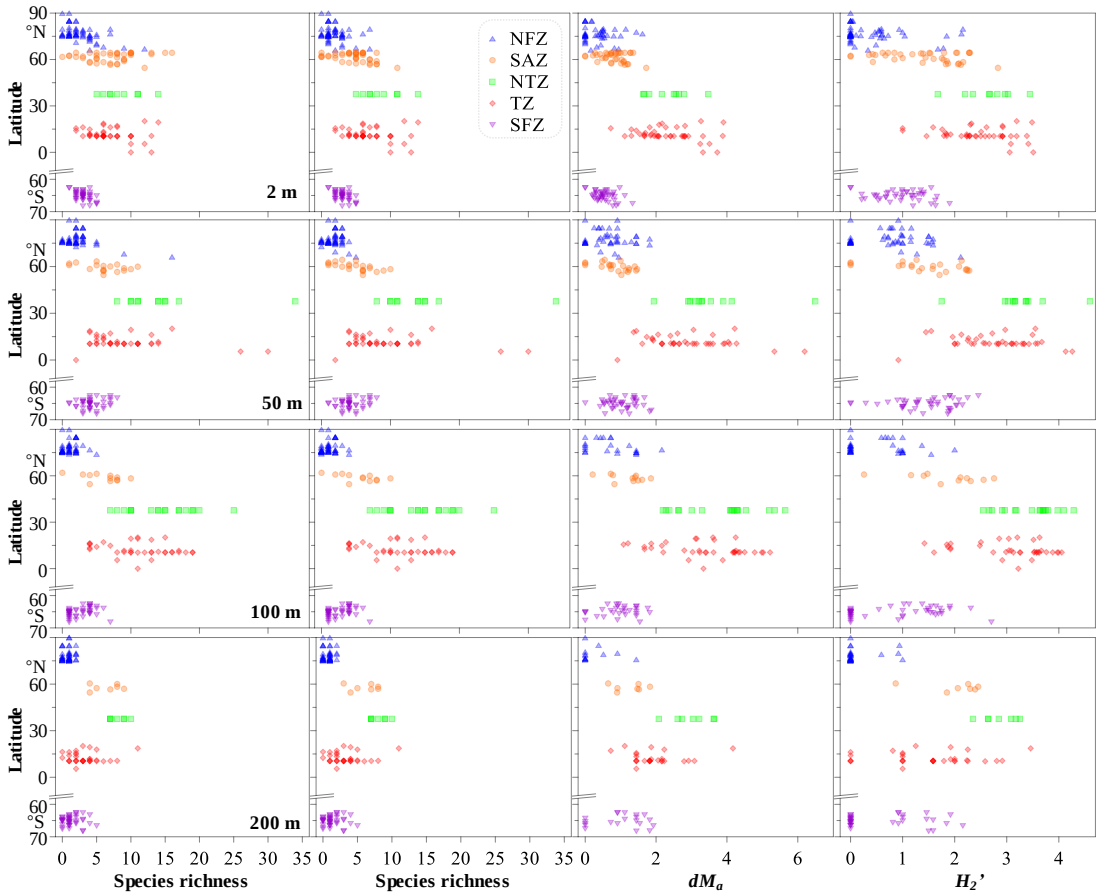

Figure S6. Latitudinal variations of tintinnid species richness, Margalef index (d_{Ma}) and Shannon index (H_2') at discrete depth in five temperature zones.

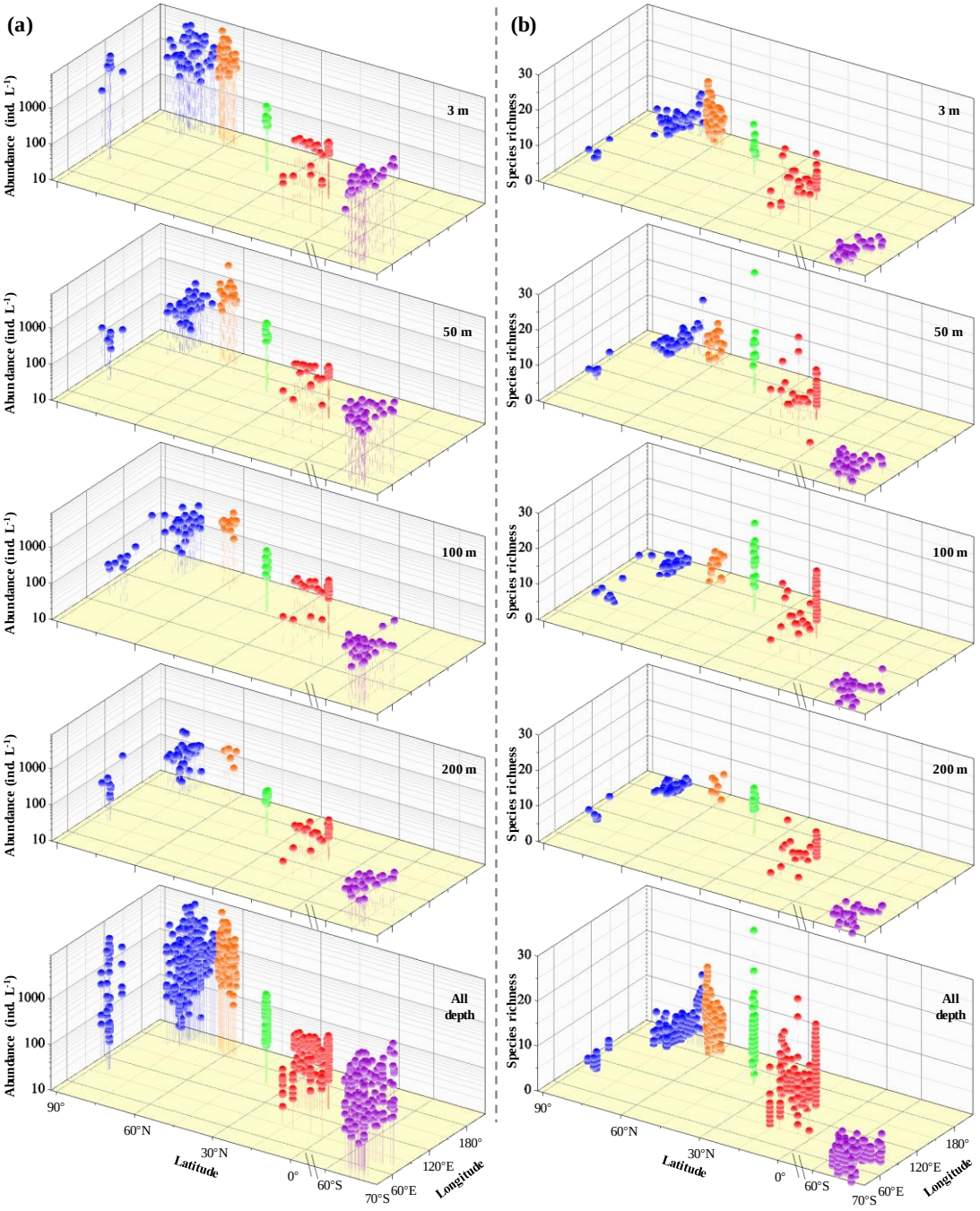

Figure S7. Three-dimensional representation for ciliate abundance (a) and tintinnid species richness (b) at discrete depth in five temperature zones.

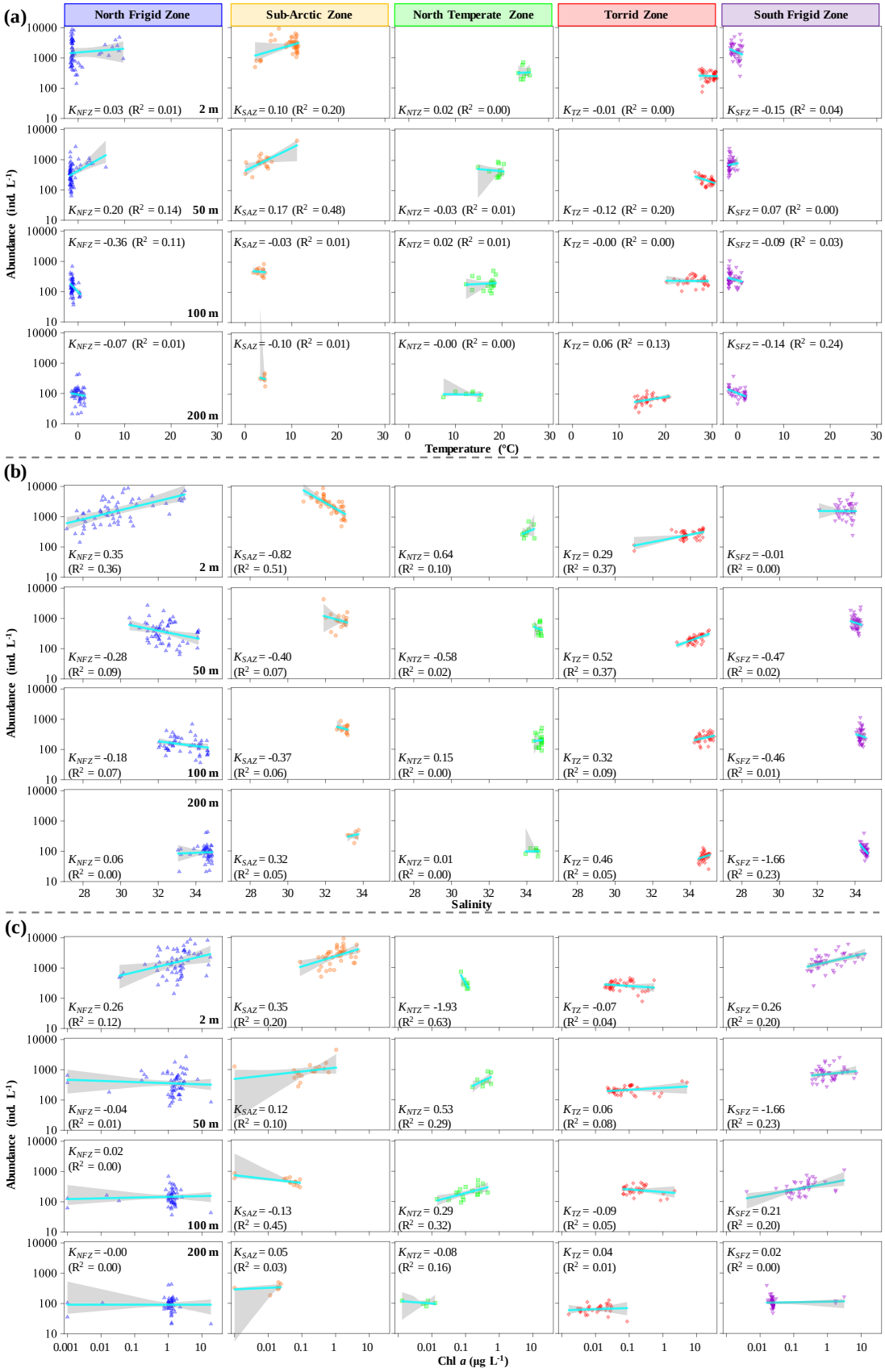

Figure S8. Variations in slopes between ciliate abundance and temperature (a)/salinity (b)/Chl *a* (c) at discrete depth in each temperature zone.

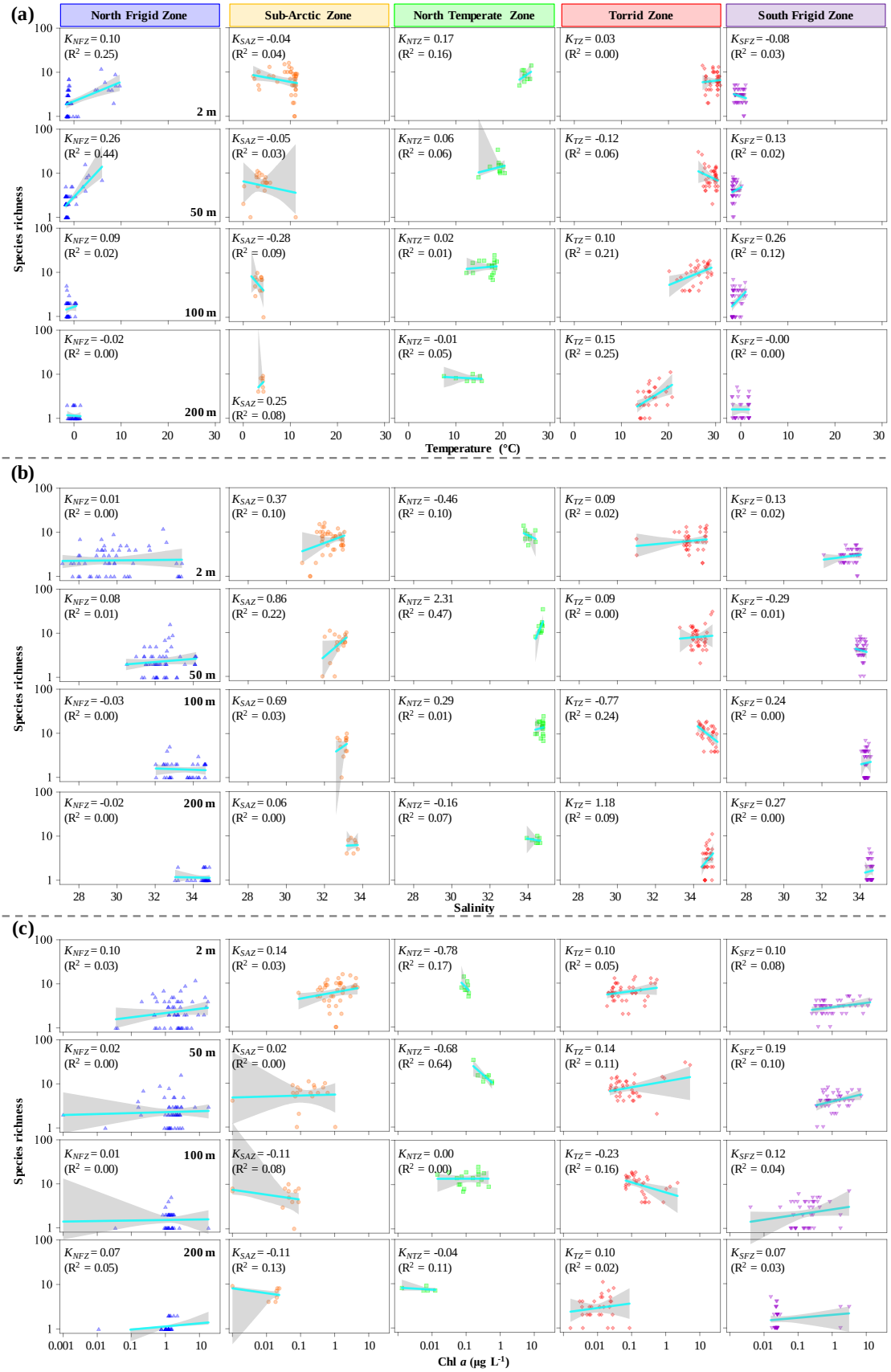

Figure S9. Variations in slopes between tintinnid species richness and temperature (a)/salinity (b)/Chl *a* (c) at discrete depth in each temperature zone.

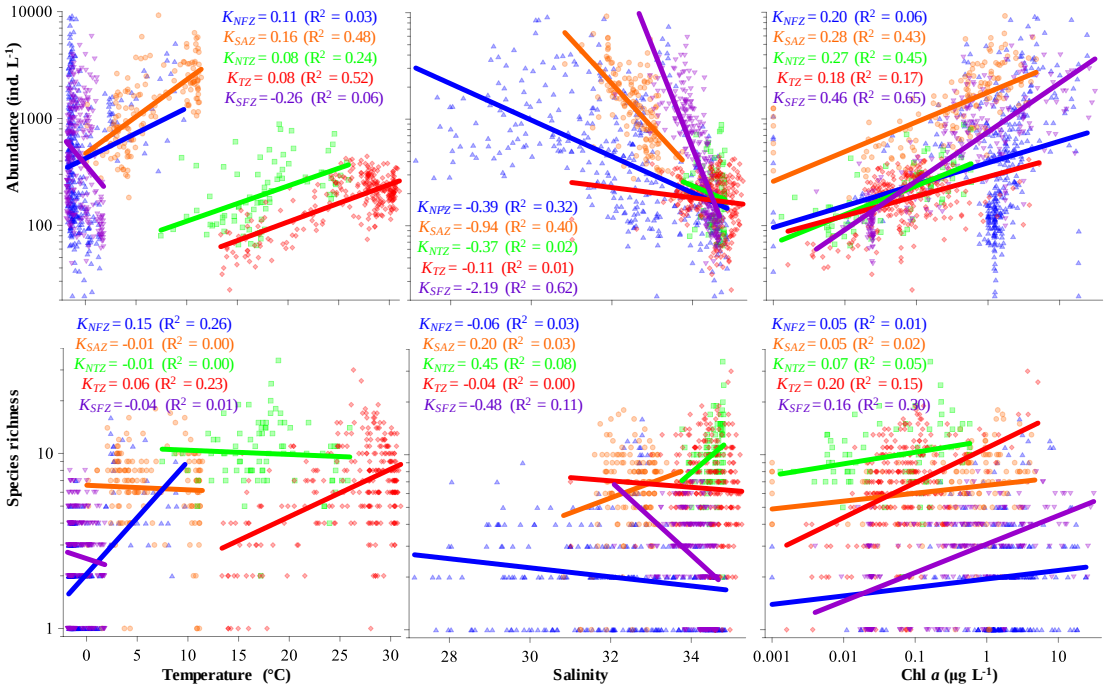

Figure S10. Variations in slopes between ciliate abundance/tintinnid species richness and environmental variables (temperature, salinity, Chl *a*) among five temperature zones. The blue, orange, green, red and purple color represent sampling dots in the North Frigid Zone (NFZ), sub-Arctic Zone (SAZ), North Temperate Zone (NTZ), Torrid Zone (TZ) and South Frigid Zone (SFZ), respectively.

Table S1. List of stations with sampling time, coordinates, abundance (ind. L^{-1}) and biomass (μg C L^{-1}) values range from surface to 200 m or bottom).

Regions	Time	Station	Longitude	Latitude	Abundance	Biomass
North	2023.07-08	CG2	96.2098°E	85.0767°N	158–4190	0.1–11.9
Frigid	Arctic	CG3	98.3113°E	84.9562°N	69–3381	0.1–6.1
Zone	Ocean	CG4	100.2868°E	84.8628°N	69–3768	0.1–10.5
(NFZ)		CG5	99.0883°E	84.9434°N	51–5735	0.0–15.1
		CG6	99.7727°E	84.8633°N	75–4269	0.1–12.2
		NP	140.6501°E	89.9267°N	159–1717	0.1–2.0
		NP2	107.5976°E	89.9949°N	68–916	0.1–1.8
		P1-01	177.0863°E	76.6724°N	44–400	0.0–1.3
		P1-02	179.9749°E	76.5230°N	66–1516	0.1–6.1
		P1-03	176.8580°W	76.3958°N	54–1552	0.0–9.5
		P1-04	174.0230°W	76.1805°N	131–3065	0.2–19.7
		P1-05	171.5702°W	75.8978°N	144–3898	0.3–14.3
		P1-06	166.4214°W	75.3281°N	109–3448	0.1–16.8
		P1-07	164.1912°W	75.0375°N	96–8554	0.1–11.0
		P1-08	162.2985°W	75.0003°N	95–2812	0.1–6.6
		P2-01	176.9015°E	78.5533°N	107–1319	0.1–1.0
		P2-02	178.1678°W	77.7876°N	22–2850	0.0–2.5
		P2-03	174.1180°W	77.5409°N	259–3030	0.3–7.6
		P2-04	165.8106°W	76.8689°N	121–511	0.1–1.0
		P2-05	163.7473°W	76.6205°N	85–926	0.0–1.8
		P2-06	161.5422°W	76.3025°N	83–1839	0.2–3.8
		P2-07	159.4842°W	76.1003°N	78–2105	0.1–9.6
		P2-08	156.5206°W	75.6650°N	122–498	0.1–3.4
		P2-09	154.3968°W	75.3862°N	113–1085	0.2–1.7
		P2-10	153.6072°W	75.3562°N	22–688	0.0–1.5
		P3-01	172.1661°E	75.1994°N	115–1615	0.1–1.7
		P3-02	173.9514°E	75.8709°N	58–809	0.1–2.0
		P3-03	177.1016°E	75.8310°N	24–1686	0.0–6.4
		P3-04	179.9365°W	75.7017°N	70–4866	0.1–5.1
		P3-05	177.0898°W	75.5532°N	452–9142	0.5–17.6
		P3-06	174.3523°W	75.3061°N	129–6476	0.1–16.2
		P3-07	171.7202°W	75.0518°N	171–8568	0.1–20.9
		P4-01	170.2067°E	79.7735°N	111–1400	0.1–2.9
		P4-02	174.4459°E	79.7318°N	121–3861	0.1–7.2
		P4-03	178.8001°E	79.6183°N	73–2203	0.1–2.2
		P4-04	176.6123°W	79.4260°N	94–1187	0.1–3.5
		P4-05	172.6759°W	79.2237°N	79–1035	0.1–2.5
		QB	99.5985°E	84.9352°N	40–7448	0.0–15.4
		R11	168.5045°W	73.9945°N	381–2333	0.4–5.5
		R12	168.4862°W	74.7334°N	273–1230	0.7–2.5
		R13	168.6150°W	75.5029°N	102–4497	0.1–17.8

		R14	168.5407°W	76.2592°N	96–1965	0.1–12.1
		R15	168.5804°W	77.0925°N	70–631	0.1–2.6
		R16	168.4254°W	77.7666°N	117–3285	0.3–27.4
		R17	168.6159°W	78.5338°N	127–923	0.1–4.2
		R18	168.5473°W	79.2322°N	135–656	0.1–1.6
		R19	168.3727°W	79.9743°N	90–1278	0.1–8.5
		R20	168.4519°W	80.7381°N	102–544	0.1–1.4
	2019.07-08 Arctic Ocean	R01	168.7527°W	66.2106°N	1078–2373	1.2–3.3
		R02	168.7482°W	66.8942°N	893–2824	1.0–10.3
		R03	168.7498°W	67.4948°N	711–1815	1.8–9.5
		R04	168.7606°W	68.1927°N	406–1244	1.0–3.1
		R06	168.7512°W	69.5333°N	324–982	0.3–1.1
		R07	168.7503°W	70.3332°N	822–5048	1.4–14.4
		R08	168.7545°W	71.1732°N	958–3514	2.2–14.4
		R09	168.7373°W	71.9933°N	781–4083	2.6–13.2
		R10	168.7448°W	72.8982°N	458–1546	1.8–13.3
		R11	168.7541°W	74.1556°N	111–1365	0.2–4.5
		M14	171.9799°W	76.0337°N	110–1009	0.1–1.5
		M13	171.9960°W	75.6067°N	37–1063	0.1–2.5
		M12	172.0089°W	75.2070°N	109–594	0.1–1.6
Sub-Arctic Zone (SAZ)	2019.07-08 Bering Sea	BL01	171.8707°E	54.5835°N	182–3855	0.3–6.9
		BL03	174.5708°E	56.5684°N	288–2528	0.6–5.1
		BL04	175.6054°E	57.3931°N	494–1320	0.8–3.2
		BL05	177.4188°E	58.2984°N	438–5626	0.6–8.8
		BL07	179.5127°E	60.0359°N	332–2278	0.7–4.9
		BL08	179.0013°W	60.3992°N	332–2210	0.4–3.5
		BL09	178.2111°W	60.7973°N	561–4179	1.2–12.1
		BL10	177.2399°W	61.2857°N	420–2216	0.7–10.5
		BL11	176.1754°W	61.9258°N	276–1346	0.7–2.6
		BL12	175.0103°W	62.5934°N	363–2185	0.5–9.4
		BL13	173.4367°W	63.2900°N	861–2944	1.3–3.9
		BL14	172.4077°W	63.7666°N	381–3249	0.5–4.5
		BS01	171.3899°W	64.3224°N	685–831	0.6–1.1
		BS02	170.8207°W	64.3342°N	491–794	0.5–1.0
		BS03	170.1292°W	64.3278°N	457–839	0.5–1.1
		BS05	168.7089°W	64.3302°N	1799–3189	2.8–5.2
		BS06	168.1097°W	64.3289°N	1555–3394	1.9–4.1
		BS07	167.4518°W	64.3344°N	1571–2786	2.0–3.7
		BS08	167.1212°W	64.3653°N	2015–3295	2.9–5.1
		BR11	167.4781°W	63.9011°N	2081–9241	4.8–18.8
		BR10	167.9389°W	63.4013°N	1872–5823	3.2–24.0
		BR09	168.4268°W	62.9067°N	1759–5004	7.6–13.5
		BR08	168.8968°W	62.4053°N	547–4973	3.1–7.4
		BR07	169.6772°W	61.6530°N	1047–6335	1.2–6.3

		BR06	170.3536°W	60.9051°N	1096–5759	2.9–11.2
		BR05	171.3069°W	59.8991°N	1031–2701	2.3–6.3
		BR04	172.2544°W	58.9074°N	542–2417	2.1–4.2
		BR03	172.7352°W	58.4049°N	862–1683	1.5–4.9
		BR02	173.2263°W	57.9018°N	444–1906	0.7–6.7
		BR01	173.6983°W	57.4050°N	440–3401	0.4–5.2
		BR00	174.0913°W	56.9533°N	326–1418	0.4–2.2
North Temperate Zone (NTZ)	2019.09 North Pacific	K01	151.9867°E	37.6300°N	80–605	0.1–0.4
		K02	152.4367°E	37.6300°N	82–436	0.1–0.6
		K03	152.8508°E	37.6300°N	88–768	0.1–1.1
		K04	153.4298°E	37.6300°N	149–886	0.1–0.9
		K05	153.8995°E	37.6300°N	65–459	0.1–0.5
		K06	154.3813°E	37.6300°N	66–271	0.1–0.7
		K07	155.0252°E	37.6300°N	85–796	0.1–0.5
		K08	155.6105°E	37.6300°N	123–394	0.1–0.5
		K09	156.0000°E	37.6300°N	79–333	0.1–0.5
Torrid Zone (TZ)	2016.12 West Pacific Ocean	W01	126.0082°E	20.1637°N	80–379	0.1–0.5
		W02	126.8644°E	19.4021°N	67–408	0.0–0.6
		W03	127.7206°E	18.6404°N	81–436	0.2–0.4
		W04	128.5767°E	17.8788°N	66–357	0.1–0.4
		W05	129.4329°E	17.1171°N	60–340	0.0–0.4
		W06	130.2891°E	16.3555°N	72–291	0.0–0.3
		W07	131.1453°E	15.5938°N	106–370	0.1–0.5
		W08	132.0015°E	14.8322°N	50–292	0.0–0.4
		W09	132.8577°E	14.0705°N	55–371	0.0–0.5
		W10	133.7138°E	13.3089°N	54–317	0.0–0.4
		W11	134.5700°E	12.5473°N	36–202	0.0–0.3
		W12	135.4262°E	11.7856°N	35–195	0.0–0.5
	2017.08 West Pacific Ocean	B16	139.8599°E	10.4688°N	79–380	0.1–0.6
		B15	139.9285°E	10.4696°N	53–352	0.0–0.8
		B14	140.0029°E	10.4717°N	51–292	0.1–0.6
		B13	140.0629°E	10.4738°N	43–405	0.1–0.6
		B12	140.0921°E	10.4754°N	58–320	0.0–0.8
		B11	140.1118°E	10.4762°N	68–271	0.1–0.6
		B17	140.1575°E	10.4807°N	62–217	0.0–0.5
		B18	140.1897°E	10.4886°N	60–241	0.1–0.4
		B19	140.2264°E	10.4973°N	87–247	0.1–0.4
		B20	140.2862°E	10.5117°N	98–285	0.1–0.6
		B21	140.3765°E	10.5329°N	127–299	0.2–0.5
		A10	140.0889°E	10.9138°N	98–343	0.2–0.6
		A09	140.1205°E	10.7213°N	51–290	0.1–0.4
		A08	140.1218°E	10.6628°N	41–264	0.0–0.5
		A07	140.1192°E	10.6199°N	75–347	0.1–0.8
		A06	140.1179°E	10.5601°N	65–288	0.1–0.9

		A05	140.1194°E	10.5233°N	140–250	0.2–0.5
		A00	140.1347°E	10.4769°N	142–221	0.3–0.5
		A01	140.1483°E	10.4335°N	140–232	0.3–0.6
		A02	140.1569°E	10.4081°N	82–212	0.1–0.5
		A03	140.1684°E	10.3706°N	68–216	0.1–0.4
		A04	140.1898°E	10.3040°N	74–341	0.1–1.1
	2021.03	I01	90.2331°E	16.1944°N	25–166	0.0–0.4
	Indian	I02	87.3815°E	11.5903°N	47–180	0.1–0.5
	Ocean	I03	90.0335°E	5.4795°N	82–416	0.2–1.0
		I04	85.4948°E	0.0000°N	123–224	0.2–0.5
South	2020.12-	M1	75.3004°E	68.3056°S	116–4835	0.2–12.5
Frigid	2021.03	F1	77.3670°E	67.5670°S	99–3286	0.1–11.7
Zone	Southern	F2	77.4691°E	68.2351°S	157–2716	0.3–11.4
(SFZ)	Ocean	P1-01	72.9834°E	64.0273°S	110–1429	0.2–8.8
		P1-02	73.0199°E	64.5077°S	78–1565	0.1–4.2
		P1-03	72.9895°E	65.1107°S	61–715	0.0–1.7
		P1-04	72.8681°E	65.5125°S	63–1077	0.1–2.2
		P1-05	72.9849°E	65.9880°S	106–1363	0.2–2.1
		P1-06	73.0222°E	66.5398°S	123–1391	0.1–2.3
		P1-07	73.1300°E	66.6766°S	92–2098	0.1–2.9
		C5-01	59.9154°E	63.3114°S	102–1318	0.1–4.8
		C5-02	60.0789°E	64.0331°S	84–1251	0.1–4.8
		C5-03	60.0450°E	64.3626°S	72–1245	0.1–2.2
		C5-04	59.9243°E	64.6821°S	89–1433	0.1–1.9
		C5-05	59.8805°E	64.8988°S	118–3011	0.2–8.0
		C4-01	55.0213°E	62.6795°S	77–1066	0.1–3.2
		C4-02	55.0079°E	63.3605°S	63–1519	0.0–2.8
		C4-03	54.9763°E	63.9855°S	163–1373	0.1–1.7
		C4-04	52.5802°E	64.6604°S	81–1576	0.1–2.5
		C4-05	52.4649°E	65.0256°S	155–3797	0.2–7.5
		C4-06	52.5879°E	65.3576°S	97–1617	0.2–5.0
		C4-07	52.4720°E	65.6381°S	110–2546	0.1–6.4
		C3-01	50.0540°E	62.6736°S	112–824	0.4–1.3
		C3-02	50.0553°E	63.3239°S	71–1819	0.1–2.2
		C3-03	50.0763°E	63.9868°S	126–1466	0.2–2.1
		C3-04	50.0017°E	64.6748°S	125–1448	0.2–3.4
		C3-05	49.7884°E	65.0165°S	128–1518	0.2–2.9
		C3-06	49.8988°E	65.3380°S	113–1881	0.2–3.4
		C3-07	51.5735°E	65.6536°S	193–3986	0.4–9.5
		C2-01	45.0690°E	62.6609°S	77–951	0.2–3.4
		C2-02	45.0564°E	63.3374°S	78–1224	0.1–2.1
		C2-03	45.0401°E	64.0020°S	83–1020	0.1–2.7
		C2-04	45.0318°E	64.6479°S	82–2395	0.1–3.3
		C2-05	45.0501°E	65.3638°S	44–1834	0.0–4.6

	C2-06	45.0176°E	66.0211°S	135–2401	0.2–4.0
	C2-07	44.9877°E	66.3468°S	108–2958	0.1–16.8
	C2-08	45.0362°E	66.4866°S	111–1812	0.1–6.2
	C2-09	44.4784°E	67.1415°S	172–2998	0.2–9.5
	C1-01	34.0062°E	65.0061°S	102–2824	0.1–13.5
	C1-02	34.0267°E	65.1671°S	77–1443	0.1–7.0
	C1-03	33.7488°E	66.0023°S	193–3975	0.2–26.1
	C1-04	33.7381°E	66.6641°S	378–5866	1.5–15.5
	C1-05	33.6791°E	67.6696°S	84–2744	0.1–7.7