Table A1. List of fossil ostracods from the Ayugawa and Tsuzuki groups.

Group	Ayugawa										Tsuzuki						
Formation	Tsuchiyama										Kurokawa		Okuyamada				
Member	Sendani Sandstone and Mudstone										Kaminohira Sandstone		Kaya Tuffaceous Mudstone				
Route	①	①	①	①	①	①	①	②	②	②			③	⑤	⑤	⑦	⑦
Sample	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	K1	K3	O2	O5	O6	O12	O13
Preservation	P	P	P	G	P	P	P	P	P	P	P	P	G	G	G	G	G
Acanthocythereis cf. *quadrata* Irizuki & Yamada							2		1								
Ambostracon iwamurensis Irizuki & Yamada	16	4	1		1	3			6		94	5					
Celtia subreticulata Irizuki & Yamada													2	4	2		2
Kotoracythere cf. *tatsunokuchiensis* Ishizaki															1		
Pectocythere cf. *ishizakii* Irizuki & Yamada	136	32	10	63	35	60	80	1	95	11	229	22					
Trachyleberis leei Huh & Whatley																3	
Trachyleberis sp.			2														
Total number of valves and carapaces counted	152	36	13	63	36	63	82	1	102	11	323	27	2	4	3	3	2

Preservation, G: good; P: poor.

Table A2. List of fossil diatoms from the Ayugawa and Tsuzuki groups.

Group	Ayugawa	Tsuzuki Group										
Formation	Kurokawa	Okuyamada Formation										
Member	Kaminohira Sandstone	Kaya Tuffaceous Mudstone Member										
Route			④	④	④	⑤	⑤	⑤	⑤	⑤		
Diatom zone (NPD)	?	?	?	2B	?	?	?	?	?	?	?	?
Sample	K2	O1	O3	O4	UT9	O7	O8	O9	O10	O11	UT1	UT8
Preservation	P	P	P	G	P	P	P	M	M	P	P	P
Abundance	R	vR	R	C	vR	R	R	R	R	R	R	vR
Actinocyclus octonarius Ehrenb.		1	2	+		1	2	2	10	4		
A. sp.				+								
Actinoptychus senarius (Ehrenb.) Ehreng.	1	3	2	2	+	12	29	43	3	62	4	
A.vulgaris Schumann				+				+				
Asteromphalus sp.				+				1				
Cavitatus exiguus Yanagisawa & Akiba				+								
C. jouseanus (Sheshukova-Poretsukaya) D.M.Williams	1		+	+			1		+	+		
C. cf. *linearis* (Sheshukova-Poretsukaya) Akiba & Yanagisawa				1		2						
C. miocenicus (Schrader) Akiba & Yanagisawa			1	1		+						
Cestodiscus sp.				+								
Cocconeis costata Greg.				+					14			
C. scutellum Ehrenb.				+					14			
C. spp.				+		1	1		3			1
Coscinodiscus marginatus Ehrenb.	1	1		1	2	7					2	
C. radiatus Ehrenb.				1					1	1		
C. spp.		2		1	6	+	+		1	2	+	5
Crucidenticula sawamurae Yanagisawa & Akiba				+								
Girdle view of *Crucidenticula*				+								
Cymatosira biharensis Pant.				+								
C. cf. *loretziana* Grunow				+								
C. ? sp.				+								
Delphineis cf. *miocenica* (Schrader) G.W.Andrews			1	+				2		5		
D. ovata G.W.Andrews				+								
D. sp.							4	1		2	+	
Diploneis spp.				+				1	3			
Eucampia sp. A (= *Hemiaulus polymorphus* Grunow)				+					3	1		
Grammatophora spp.	+			+					1			
Hemiaulus bipons (Ehrenb.) Grunow				+					1			
Ikebea tenuis (Brun) Akiba				+					+		1	
Kisseleviella carina Sheshukova-Poretsukaya				+				5	12		8	
Nitzschia sp. A				+				+	1	+		
Odontella aurita (Lyngb.) J.A.Agardh								+	+			
Paralia sulcata (Ehrenb.) Cleve	2	2	17	2	6	20	14	10	4	4	3	
Plagiogramma staurophorum (Greg.) Heib.				+					1			
Porosira sp.				+				+				
Proboscia alata (Brightw.) Sundstöm				+								
P. cf. *interposita* (Hajós) Jordan & Priddle			2	+				+				
Pseudodimerogramma elegans Schrader				+					5			
P. elliptica Schrader			1	1			3	+	1			
Pyxilla sp.				+								
Rhaphoneis amphiceros Ehrenb.									3		2	+
Rhizosolenia styliformis Brightw.				+		1			1			2
R. sp.				+								
Stellarima microtrias (Ehrenb.) Hasle & P.A.Sims				+			4	+	3			
Stephanogonia hanzawae Kanaya				+								
Stephanopyxis spp.	5	28		+	16	47	5		3	8	68	12
Stictodiscus kittonianus Grev.				+								
Thalassionema nitzschioides (Grunow) Mereschkowsky s.l.	29	3	1	9	1	4	3	3	3		5	6
T. spp.				+			+				1	
Thalassiothrix longissima Cleve & Grunow	1			+					+			
Triceratium condecorum Brightw.				+			9	21		2		
Trochosira spinosa Kitton	10		14	81		4	25	10	3	8		
Aulacoseira spp.			3	+		1		1	3	1	6	
Navicula spp.									3			
Total number of valves counted	50	40	44	100	31	100	100	100	100	100	100	26
Resting spore of *Chaetoceros*	135	8	11	89	2	21	34	43	375	47	43	10

Presevation, P: poor, G: good. Abundance, C: common, R: rare, vR: very rare.

Table A3. List of fossil diatoms from the Yamabe and Yamagasu groups.

Group	Yamabe Group							Yamagasu G.		
Formation	Hayama Formation							Nakatarō F.		
Route		⑧	⑧	⑧	⑧	⑨	⑨			
Diatom zone (NPD)	?	2A	?	?	?	2A	?	2A	2A	2A
Sample	H1	H2	H3	H4	H5	H6	H7	N3	N4	N5
Preservation	P	P	P	P	P	P	G	P	P	P
Abundance	R	R	R	R	R	R	A	R	R	R
Actinocyclus octonarius Ehrenb.	1	4	3	1	5	1	3		1	1
A. sp.	3	1		1	2	1	+	2		
Actinoptychus senarius (Ehrenb.) Ehrenb.	4	3	3		3	1	9	+	+	+
Arachnoidiscus sp.		+			+					
Azpeitia bukryi (Barron) Barron							+			
A. praenodulifera (Barron) P.A.Sim & G.A.Fryxell				1			+	1		1
Cavitatus exiguus Yanagisawa & Akiba		1	1	+	+	+	1		+	
C. jouseanus (Sheshukova-Poretsukaya) D.M.Williams		2					+		1	+
C. linearis (Sheshukova-Poretsukaya) D.M.Williams							+	+		1
C. miocenicus (Schrader) Akiba & Yanagisawa	1						1			
Cocconeis costata Greg.							+			
C. spp.							+			
Coscinodiscus marginatus Ehrenb.	4	2	2	6	2	2	+	11	6	10
C. perforatus Ehrenb.							+	2	1	3
C. radiatus Ehrenb.	2	1	3		1	2	2	3		
C. spp.			1				+			
Cymatosira debyi Temp. & Brun							+			
Diploneis didyma (Ehrenb.) Cleve			+				+			
D. smithii (Bréb.) Cleve	+	2				1				
Ditylum sp.							+			
Eucampia sp. A							1			
Grammatophora spp.			+							
Hemiaulus sp.					1		+			
Hyalodiscus obsoletus Sheshukova- Poretsukaya		+		1			+		1	+
Ikebea tenuis (Brun) Akiba	+				1		+			
Kisseleviella carina Sheshukova-Poretsukaya							15			1
Melosira sol (Ehrenb.) Kützing				1			+	2		
Navicula sp.							+			
Nephrodiscus sawamurae (Akiba) Komura							+			
Odontella aurita (Lyngb.) J.A.Agardh			1							
O. sp.							+			
Paralia sulcata (Ehrenb.) Cleve			1	3	3					2
Porosira sp.							+			
Proboscia interposita (Hajós) Jordan & Priddle							+	1		
Pseudodimerogramma elliptica Schrader		+			+		+			
Pseudotriceratium punctatum (Ralfs) Simonsen							+			
Pterotheca subulata Grunow							+			
Raphidodiscus marylandicus Christian							1			
Rhabdonema sp.							+			
Rhaphoneis amphiceros Ehrenb.		+	+		+		2			
R. diamantella G.W.Andrews							+			
R. cf. *fusiformis* G.W.Andrews							+			
Rhizosolenia hebetata f. *hiemalis* Gran							1			
R. styliformis Brightw.	2	2		1			+			2
Rouxia naviculoides Schrader							+			
Stellarima sp.	1	2	7	3	5	5	2	4	1	4
Stephanopyxis spp.	53	71	72	74	73	84	3	67	82	67
Stictodiscus kittonianus Grev.	1						1			
Thalassionema nitzschioides (Grunow) Mereschkowsky s.l.	2	3	3	3	1	1	1	3	2	4
Thalassiosira fraga Schrader		2				1		3	5	4
T. leptopus (Grunow) Hasle & G.A.Fryxell							+			
T. mizunamiensis Yanagisawa							+			
T. cf. *umaoiensis* Akiba							3			
T. sp 1.							+	1	+	
Thalassiothrix longissima Cleve & Grunow							+			
Triceratium condecorum Brightw.							+			
Trochosira spinosa Kitton	26	1					53			
Aulacoseira spp.		3	3	5	3	1	1		+	
Genus et species indet.							+			
Total number of valves counted	100	100	100	100	100	100	100	100	100	100
Resting spore of *Chaetoceros*	493	218	144	133	182	123	212	12	21	16

Preservation, G: good; P: poor. Abundance, A: abundant; R: rare.

Table A4. List of fossil planktonic foraminifers from the Yamagasu Group.

Group	Yamagasu					
Formation	Igami				Nakatarō	
Route	⑩	⑩	⑩	⑩		
Sample	I1	I2	I3	I4	N1	N2
Preservation	P	G	P	P	P	P
Catapsydrax unicavus (Bolli, Loeblich & Tappan)		1	1			
Dentoglobigerina baroemoenensis (LeRoy)					1	2
Dentoglobigerina venezuelana (Hedberg)		1				
Globigerina praebulloides (Blow)					2	2
Globigerinoides quadrilobatus (d'Orbigny)			1			
Globoquadrina dehiscens (Chapman, Parr & Collins)					3	2
Globorotalia quinifalcata (Saito & Maiya)			1	1		
Globoturborotalita druryi (Akers)		1				
Genus et species indet.	1				3	9
total	1	3	3	1	9	15

Preservation, G: good; P: poor

Table A5. Data sources for the stratigraphic correlation (Fig. 6) among the selected groups of the Miocene in the Setouchi Geologic Province. Abbreviations: D (diatom), PF (planktonic foraminifera), CN (calcareous nannofossil), R (radiolarian), O (ostracod), Sr (strontium isotope dating), FT (fission track dating), U–-Pb (U–-Pb dating), and M (magnetostratigraphy).

No.	Group	Formation (Member)	Method	Biozone, Chron, Age	Main References
①	Bihoku	Itabashi	D	NPD3A–NPD3B	Watanebe et al. (1999)
		Upper Mudstone: Itabashi	PF	N8–N9	Okamoto (1992)
		Korematsu–Itabashi	CN	NN4 (CN3)	Yamamoto (1999)
		Lower Sandstone–Upper Mudstone	CN	NN4 (CN3)	Okamoto (1992)
		Tajibe	PF	N8–N9	Goto et al. (2013)
		Tajibe	CN	CN3	Goto et al. (2013)
②	Katsuta	Takakura	D	NPD3A–NPD3B	Watanebe et al. (1999)
		Takakura	PF	N8–N9	Saito (1963), Yoshimoto (1979)
③	Fujiwara	Toyoda	PF	Lower N8	Tai and Kato (1979), Yoshida (1991)
		Kokuzō	FT	17.9 ± 1.1 Ma (1σ)	Nishioka et al. (2001)
④	Tsuzuki	Okuyamada (Kaya)	D	NPD2B	Kato et al. (2017), This study
⑤	Yamabe	Hayama	D	NPD2A	This study
		Sōgo	FT	17.7 ± 1.6 Ma (1σ)	Nishioka et al. (2001)
⑥	Yamagasu	Nakatarō	D	NPD2A	This study
		Igami	PF	Upper limit: N6	This study
⑦	Awa	Makino	PF	N8–N9	Yoshida (1979, 1987), Fujiwara et al. (2005)
		Makino	CN	CN3	Fujiwara et al. (2005)
		Hiramatsu	PF	Lower limit: N6	Fujiwara et al. (2005)
⑧	Ayugawa	Tsuchiyama, Kurokawa	O	Probably NPD2B	This study
⑨	Ichishi	Katada	PF	N8	Yoshida (1991), Oshida et al. (2018), Hoshi et al. (2019a)
		Katada	M	Reverse	Hayashida and Ito (1984), Hoshi et al. (2019a)
		Katada	U-Pb	17.09 ± 0.06 Ma (2σ)	Hoshi et al. (2019a)
		Uppermost Ōi–Katada	PF	N8	Ito (1982)
		Ōi (Mitsugano)	U-Pb	17.03 ± 0.11 Ma (2σ)	Hoshi et al. (2019a)
		Ōi (Mitsugano)	PF	N7–N8	Yoshida (1991), Oshida et al. (2018), Hoshi et al. (2019a)
		Ōi (Mitsugano)	D	NPD2B	Oshida et al. (2018)
		Ōi (Mitsugano)	M	Reverse–Normal–Reverse–Normal	Hayashida and Ito (1984)
		Ōi (Isegi)	M	Mostly normal	Hoshi et al. (2019b)
		Haze (Iu)	D	NPD2A	Hoshi et al. (2019b)
		Haze (Iu)	M	Mostly reverse	Hoshi et al. (2019b)
⑩	Morozaki	Utsumi	D	NPD2B	Ito et al. (1999)
		Upper Yamami–Utsumi	M	Normal	Hayashida (1986)
		Yamami	D	NPD2B	Ito et al. (1999)
		Upper Toyohama	R	P-C assemblage	Sugiyama (1992)
		Upper Toyohama	PF	N6–N7	Ibaraki et al. (1984), Yoshida (1991)
		Upper Toyohama	D	NPD2B	Oe (1993)
		Middle–Upper Toyohama	D	NPD2B	Ito et al. (1999)
		Lower Toyohama–Lower Yamami	PM	Reverse	Hayashida (1986)
		Himaka	U-Pb, FT	17.9 ± 0.1 Ma, 17.8 ± 1.3 Ma	Uchida et al. (2019)
⑪	Mizunami	Oidawara	D	NPD4A (15.8–15.7 Ma)	Sawamura (1963), Mori (1974), Koizumi (1981), Yanagisawa (1993), Kawamura et al. (2011)
		Oidawara	M	Reverse	Hayashida (1986), Hoshi et al. (2015)
		Oidawara	R	*C. costata*	Sugano (1976), Sugiyama and Furutani (1992)
		Oidawara	PF	N8–N9	Saito (1963)
		Shukunohora	PF	N8	Saito (1963), Ibaraki (1981)
		Akeyo (Hazama)	U-Pb	17.8 ± 0.4 Ma (2σ)	Sasao et al. (2018)
		Akeyo (Hazama)	FT	16.3 ± 0.8 Ma, 15.8 ± 1.8 Ma, 16.2 ± 1.2 Ma (2σ)	Sasao et al. (2018)
		Akeyo (Yamanouchi)	D	NPD2B	Gladenkov (1998)
		Akeyo (Yamanouchi)	Sr	17.8 ± 0.3 Ma	Ando et al. (2020)
		Akeyo (Togari)	FT	16.3 ± 2.2 Ma (2σ)	Sasao et al. (2018)
		Akeyo (Tsukiyoshi)	FT	16.9 ± 1.2 Ma (2σ)	Sasao et al. (2018)
		Akeyo	M	Reverse	Hayashida (1986)
		Hongō	U-Pb	18.8 ± 0.3 Ma (2σ)	Sasao et al. (2018)
		Hongō	FT	16.7 ± 1.4 Ma, 17.7 ± 1.4 Ma, 16.9 ± 1.2 Ma, 18.6 ± 2.4 Ma (2σ)	Sasao et al. (2018)
		Hongō	M	Normal	Hayashida (1986), Hiroki and Matsumoto (1999)
⑫	Iwamura	Tōyama (Maki)	U-Pb	18.4 ± 0.4 Ma (2σ)	Sasao et al. (2018)
		Tōyama (Maki)	FT	17.2 ± 2.2 Ma, 16.6 ± 1.6 Ma, 16.6 ± 2.6 Ma (2σ)	Sasao et al. (2018)
		Tōyama (Maki)	D	NPD2B	Ito et al. (1999)
		Agi (Noda)	FT	19.1 ± 2.0 Ma (2σ)	Sasao et al. (2018)
⑬	Shitara	Kadoya	M	C5Cr or C5Dr or C5Dr.2r	Hoshi and Saida (2009), Hoshi and Ogawa (2012)
		Kadoya	FT	17.2 ± 0.8 Ma, 17.4 ± 0.8 Ma, 17.8 ± 0.8 Ma (1σ)	Hoshi et al. (2006)
		Ōno	M	C5Dn or C5Dr.1n or C5En	Hoshi and Saida (2009), Hoshi and Ogawa (2012)
		Ōno	R	*C. coronataformis*	Hoshi et al. (2000)
		Kawakado	M	C5Dr or C5Dr.2r or C5Er	Hoshi and Saida (2009), Hoshi and Ogawa (2012)
⑭	Tomikusa	Awano	D	NPD2B	Ito et al. (1999)
		Awano	M	Normal	Hayashida (1992)
		Upper Arakida–Awano	M	Normal (C5Dn or C5Dn.1n)	Sako and Hoshi (2014)
		Upper Ōshimojō–Lower Arakida	M	Reverse (C5Dr.1r or C5Dr.2r)	Sako and Hoshi (2014)
		Lower Nukuta–Middle Ōshimojō	M	Normal (C5Dn.1n or C5En)	Sako and Hoshi (2014)
		Lower Wachino	M	Reverse (C5Dr.2r or C5Er)	Sako and Hoshi (2014)