On the Fluctuation of the Main Stream Axis and its Boundary Line of Kuroshio. ※

By Michitaka Uda

Formerly the present author has reported [1) 2) 3)] a surprisingly anormalous change of Kuroshio in the seas south of Japan which has occurred in recent years. The results of the continued researches are shown in the following paper.

I. The Main Stream Axis of Kuroshio.

Now we may adopt the central axis of the zone of the strongest currents as for the main axis of Kuroshio.

Then we can plot the zone of the strongest currents on the basis of the maps showing the distribution of the currents computed dynamically* during the years from 1936 to 1943 and we can show the stream axis in Tab. 1A and Tab. 1B as indicated Fig. 1 - 4.*

Also we may put the breadth of the strongest currents as for the breadth of the Kuroshio Stream. Moreover, we indicated the boundary line of water masses in plotting the location of the maximum horizontal gradient of surface water temperature (its distance from the coast d sea-miles), and the zone of the highest water temperature θ_{max}, at the sea surface which lies approximately on the zone of the maximum gradient of the water temperature at the section (its distance from the coast d_0 sea-miles). (See Fig. 5)

Since the stream axis of Kuroshio lies nearly at the location of θ_{max} [2)], we may adop the location of θ_{max} for the stream centre (distance from the coast d_0 sea-miles). The yearly variation of d_0 with the breadth of Kuroshio warm current $\frac{d_1}{d_2}$ and $\frac{\theta_{max}}{\theta_{min}}$ at 200m depth with its distance d' are showin in Fig. 5, 6.

Inspecting Fig. 1 - 6, we can easily recognize that Kuroshio current in the period from 1937 to 1942 flows far away to the offing of the Kii Penninsula,

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1) Uda, M.: On the Recent Hydrographical Conditions of Kuroshio in the South Waters of Japan. Journ. Imp. Fisheries Expt. St. No. 10, 1940.
2) Uda, M.: On the Structure of the Boundary of Water Masses. J. Oceanogr. Soc. Vol. 2, No. 4, 1943.
3) Uda, M.: On the Correlated Fluctuation of Kuroshio Current and the Cold Water Mass. Oceanogr. Mag. Vol. 1, No. 1, 1949.

* Mainly Basing on the Materials by Hydr. Dept. Japan Surveyed.

especially the years most distant to the offing have fallen in 1938-1939 and the secondary maximum of remoteness in the year of 1941.

Since after about the years 1942-1943 the Kuroshio current has shown the signs to approach near the coast and to recover its intensity gradually.

Before the occurrence of the anomalous state of Kuroshio, the dominant inflow from the sea south off Hyūga-Nada and also the development of the vortical current area A of warm water mass (its centre lying at about 30°N. 134°E) south off the province of Tosa (Shikoku) were found firstly.

It is considered that the stronger monsoon in the winter of the years 1934 and 1935 surpressed the intensity of north-easterly-going Kuroshio current in the regions south off Kagoshima Prefecture and west off Ryūkyū Islands by blowing on the sea surface and conversely it accellerated the intensityof easterly-going Kuroshio current in the regions south off Tosa Bay, Kii Penninsula and Enshu Nada by blowing on the sea surface from the westerly Direction. Then it is concluded that the continuity of the amount of flow in the Kuroshio area between the south off Kagoshima Pref. and off the Kii Penninsula does not consist, and the inflow from the south sea together with the coastal upwelling should be resulted.

In accompany with the development and the decay to vanishment of the anomalous cold water mass (B) off Kii Penninsula, the anomalous condition of Kuroshio has appeared and after the gradual settling down it recovered to the normal state. (See Fig. 1 - 4). As we see in Fig. 1, 2, 3 the centre of the warm water mass (A) south off Tosa (Shikoku Is.) displaces to the northwestern area in the middle period of the anomalous years about of 1938 and 1939, and of the later period of the anomalous years about of 1941 and 1942 it translates back to the south eastern offing area.

Nearly coming to the end of the anomalous period of Kuroshio the A water mass (anticyclonic vortex A) deforms to the flat and the EWly-elongated area and degenerates in smaller and smaller. (Fig. 3, 4). And moreover, in accord with the easterly translation of its centre the above-mentioned inflow from the seas south off Hyuga (Kyushu, and Tosa (Shikoku) into the Kuroshio Stream decreases. Also the area of the B water mass (cyclonic vortex B) shrinks in and moves back to north. The another warm water mass C (anticyclonic vortex C) lies at the east of Hatidyō Is. During the anomalous period of Kuroshio, after the stream flowing around the north-eastern area of the vortex A and coming to the south of the vortex B, the Kuroshio current diverges its stream-lines and

Fig. 1 Kuroshio in the early period of its anomalous state. (Dec. 1936–Jan. 1937)

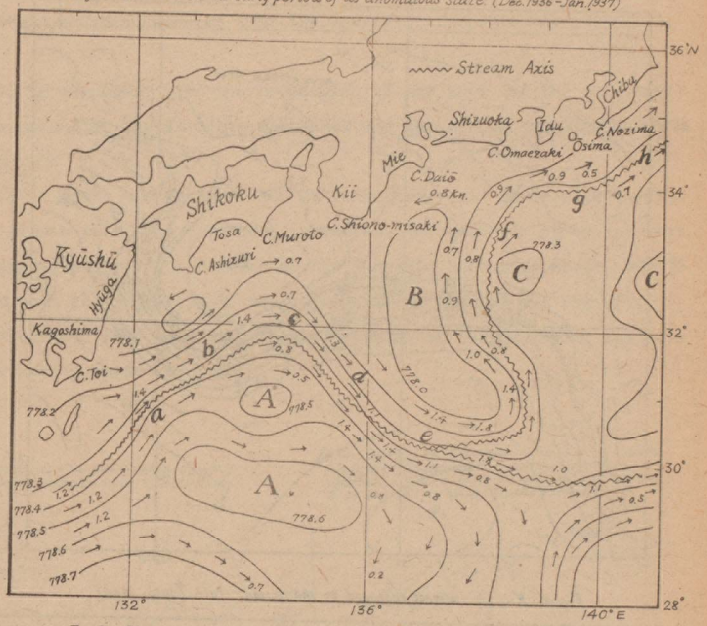


Fig. 2 Kuroshio in the prosperous period of its anomalous state. (June, Aug. 1938)

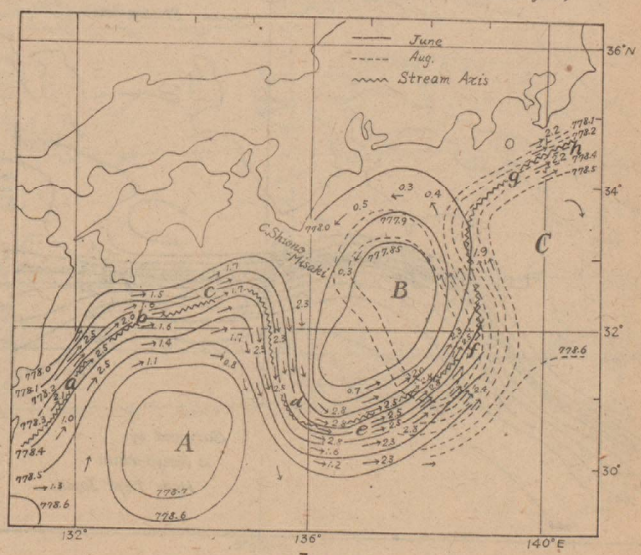


Fig. 3. Kuroshio in the later period of its anomalous state. (Nov. 1942).

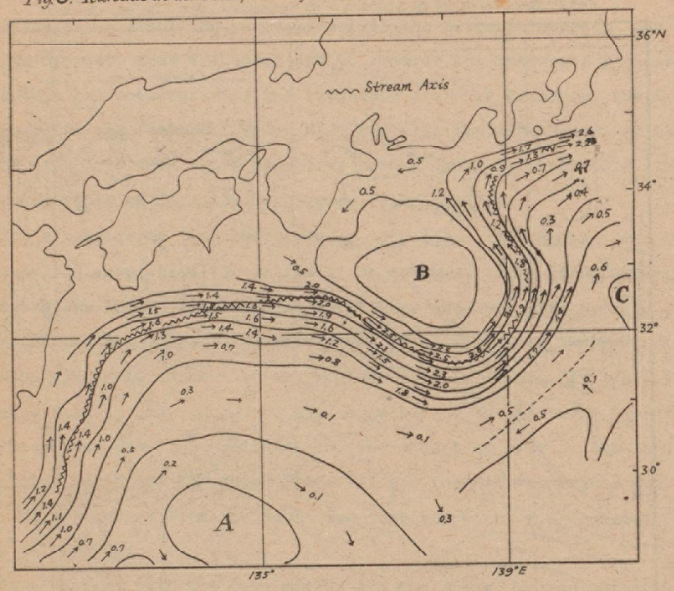
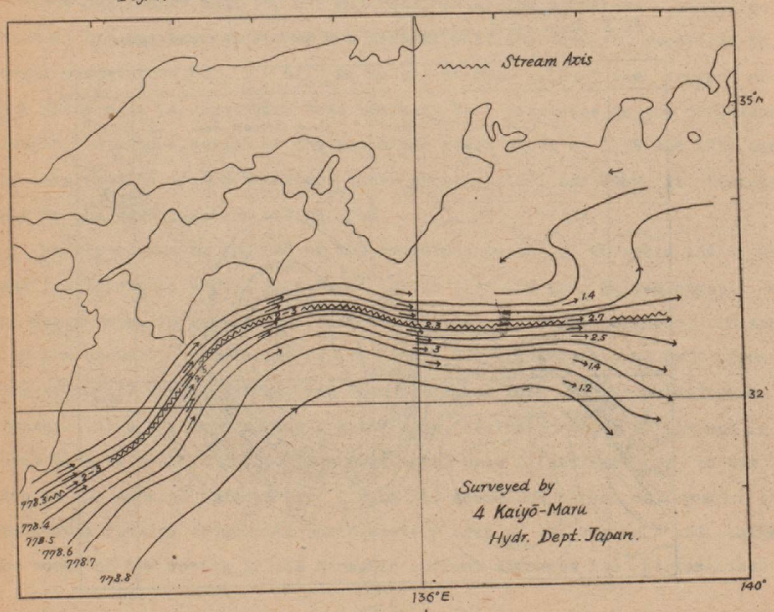


Fig. 4. Kuroshio almost restored to the normal state. (July, 1946).



branches off to the south and to the north of which the latter flows to NE around the vortex C. As a consequence of them the amount of Kuroshio decreases considerably.

In short, in accompany with the broadening of the area of the cold water mass (B), the amount of the Kuroshio decreases and the path of the stream shifts to east and south.

Obviously it shows the decay of the Kuroshio current. However as the distance of the stream axis from the coast increases, the velocity of the current increases proportionally. The breadth of the Kuroshio indicates about 20 - 30 sea-miles and most frequently 30-50 sea-miles. (Table 1A, 1B. and Fig. 7).

It is recognized that according to the decrease of the breadth of Kuroshio the current velocity tends to rise.

Fig. 5. Distance (d_s) of the zone of the highest surface water temperature from the coast of C. Shiono Misaki.

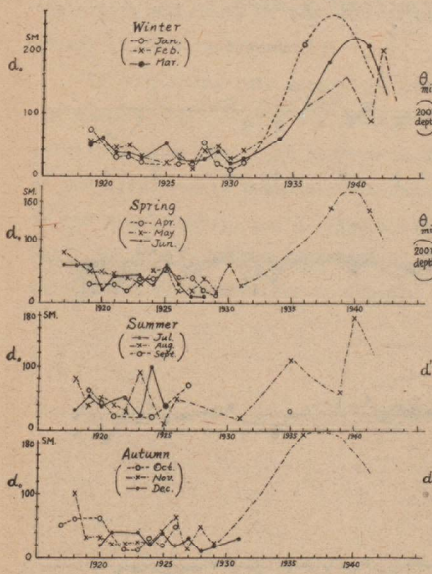


Fig. 6. The minimum Temperature ($\theta_{min.}$) at the depth of 200m in the oceanographic section within 100 SM. its distance (d') from the coast of Shiono Misaki, in addition to the breadth (d_1) of the Kuroshio Warm Current.

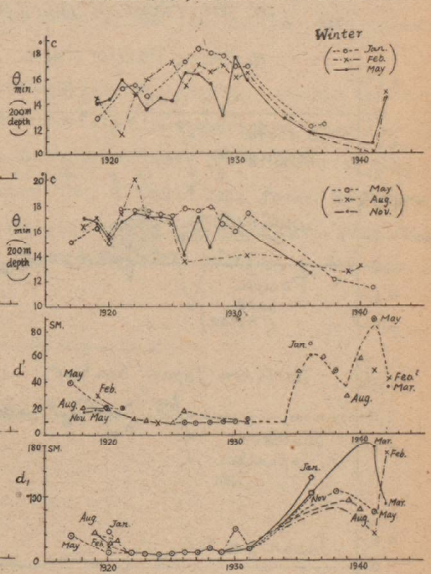


Fig. 7. Distance (d_o) of the Stream Axis of Kuroshio from the coast in the Anomalous Years. (from Tab. 1B.)

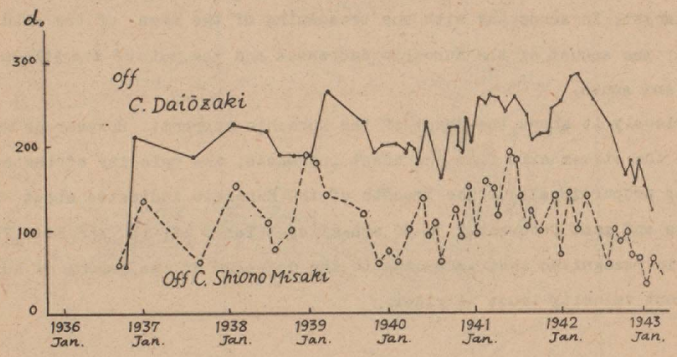
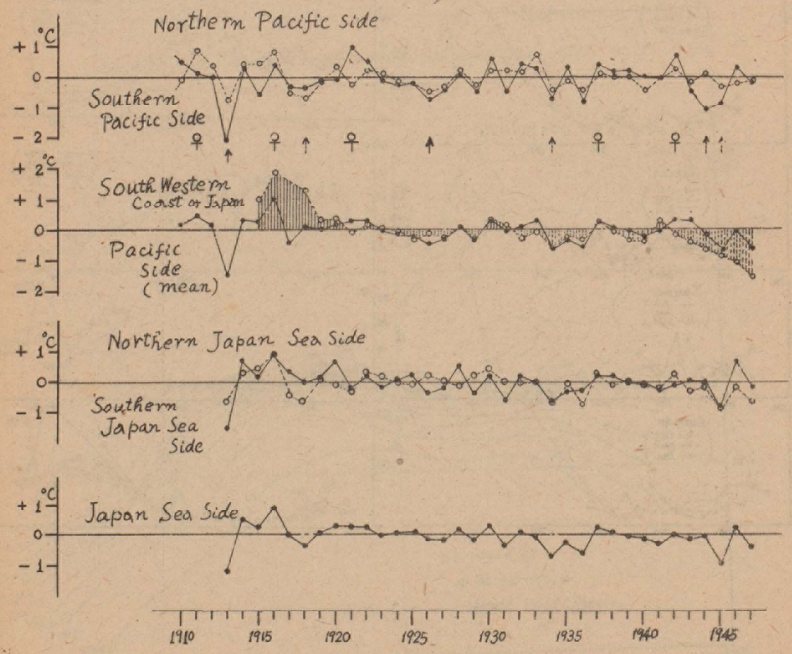


Fig. 8. Anomaly of Water Temperature (Annual Mean °C) at the Fixed St. along the Coast of Japan.



About in the winter and the spring in the year of 1938 the anomalous state of Kuroshio attains to its flourishing maximum and corresponds the most expanded anomalous cold water area. At the same time the bredth of the Kuroshio current became broader than normal i.e. to about 50 sea-miles.

In general, inspecting the distribution of the current velocity in the anomalous period of Kuroshio, the current flow is most conspicupus in the eastern region of Kuroshio area. After the anomalous period of Kuroshio, it can be remarked that the Kuroshio current became stronger in the western sea-region of Kuroshio. (Refer to Table 1A.)

The appearance of the cold water-mass B which was inferred[1)3)] as originated from the upwelling water of the sub-arctic intermediate current, is later than the prosperous period of the Oyashio cold current in the North Eastern Sea region of Japan.

The decline of the water temperature along the coast of Japan in recent years to its minimum in 1944 and 1945 is shown in Fig. 8. Thus the phase of the growth and decay of the cold water mass (B) and that of the cold coastal waters differs fundamentally.

In concluding this report the present author wishes to state his heartiful thanks to those who gave him printed materials (Oceanographic charts or unpublished materials) with respect to Kuroshio current, Dr. K. Suda(the director of the Hydrographic Department in Japan), Mr. S. Daitō (the former hydrographer in the Hydr. Dept.), Dr. K. Kimura (the director of the Tōhoku Reg. Fish. Res. Lab.) and Dr. M. Nakano (the head of the Oceanographic Section in the Central Meteorological Observatory in Japan).

Table 1A. Dynamically Computed Kuroshio Current (Max. velocity in knot).
St. a–h (see Fig. 1). Abr.: E… early decade, M… middle decade, L… late decade.

Year	Month	St. a Hyuga C. Toi Saki S	St. b Tosa C. Ashizuri S.	St. c Tosa SE C. Muroto	St. d Kii S C. Shiono misaki	St. e Mie C. Daio SSE	St. f Siduoka C. Omaezaki S	St. g Izu Ō sima S	St. h Chiba C. Nozima SE
1936,	M, L. Oct.	…	…	…	1.2	NE 1.3	1.0	…	…
1936,	Dec. —	NE 1.2	NE 1.3	E 0.8	SE 1.1–1.4	E 1.4–1.8	N 0.8–1.0	ENE 0.5–0.9	0.5–0.7
1937,	E. Feb.	…	…	SE 1.5	…	…	1.0	…	…
1937,	Jul. ~Aug.	…	…	SSE 0.7	SE 0.7	E 1.0–1.2	N 1.1–1.2	1.0–1.1	…
1938,	Feb.	NE 1.6	NE 1.7–2.3	E 1.0–1.1	SE 2.7	E 2.7	N 1.2–1.5	…	…
1938,	E. June	NE .1	ENE 1.4–1.5	ENE 1.7	S 2.5	ENE 2.8	NE 2.3–2.5	…	…
1938,	Aug.		NE 1.7–1.8	E 1.9–2.3	SSE 2.3–2.4	SE 2.4–2.8	NE 2.4	NE 2.2	NE 2.2
1938,	Oct.	NE 1.2	ENE 1.4–1.6	E 1.5–1.7	ESE 1.5–1.6	E 1.5–1.7	N 2.3	ENE 1.8–2.1	2.1
1939,	Jan.	NE 1.1–1.3	ENE 1.1–1.3	ESE 1.4–1.6	SE 1.4–1.6	E 1.2–1.3	N 1.0	ENE 1.0–1.4	…
1939,	March	NNE 2.4–2.9	ENE 1.5–2.0	ESE 1.5–2.0	SE 1.7–2.0	NE 2.0	ENE 1.5	E 1.5	ENE 1.5
1939,	Aug.	N 1.2	ENE 1.7	ESE 1.4–1.5	SE 1.4–2.0	E 2.1	ENE 1.2–1.5	ENE 1.2	…
1939,	Oct.	NE 1.6–2.8	NE 1.5	ENE 2.0–2.5	SE 1.4	E 2.3–2.6	N 0.9	ENE 2.2	ENE 2.0–2.2
1939,	Dec.	NE 2.0	ENE 1.1–1.3	E 1.0–1.5	SE 1.5–2.0	ESE 1.4–2.0	N 1.5–2.0	ENE 1.3–1.5	ENE 1.3–1.5
1940,	M.L. Jan.	NE 2.0	NE 2.0	E 1.4–1.6	SE 2.0–2.7	ESE 1.3–1.6	NE 1.2–2.0	NE 0.6–1.4	NE 0.9–1.7
1940,	E.M. March	NNE 1.0–1.8	NE 1.0	E 1.2	SE 1.5	E 1.7	NE 1.7	NE 1.6–1.8	ENE 1.4–2.0
1940,	E. April	ENE 1.0–1.4	ENE 1.2	ENE 1.0	SE 1.2	SE 1.3–1.7	NNE 1.3–1.6	NE 1.4	NE 1.4–1.6
1940,	L. April	NE 1.1–1.6	E 1.5–1.7	ESE 1.4	SE 1.2–1.4	NE 0.8–1.1	ENE 1.7–1.9	NE 2.2	NE 1.6–2.0
1940,	L. May	…	ENE 2.0–2.3	E 2.1	SE 1.6–1.8	E 1.4–1.7	NE 1.2–1.6	NNE 1.7–2.0	NE 2.0
1940,	E.–M. Jun.	NE 1.6	NE 2.3	ESE 2.0	SE 2.0	ENE 2.0	N 1.7	NE 1.2	NE 1.5
1940,	M.–L. Jun.	…	…	…	SE 2.0	E 1.7	NE 1.5	…	NE 2.2–2.5
1940,	July	…	NE 1.4–2.0	NE 1.4	ESE 2.0	SE 2.0	NNE 2.0	ENE 1.4–1.6	NE 1.4–1.5
1940,	E.–M. Aug.	NE 1.8	NE 2.0	ENE 1.1–1.3	SE 2.0	ESE 1.6–2.0	N 1.4–1.9	ENE 1.1	NE 1.1
1940,	L. Aug.	NE 1.0–1.6	NE 1.8–2.0	E 1.8–2.0	SE 2.0	E 1.3–1.6	N 1.0–1.8	ENE 1.6	NE 1.6
1940,	L. Sept.	NE 1.6–1.8	NE 1.6–2.0	ESE 1.4–1.8	SE 1.6–2.0	E 1.3–1.7	N 1.4–1.8	NE 1.5–1.8	…
1940,	E. Oct.	NE 1.4–1.8	ENE 1.2–1.5	ENE 1.2–1.4	SE 1.8–2.0	E 1.2–1.6	N 1.2–1.6	NE 1.6–1.8	NE 1.6
1940,	L. Oct.	NE 1.6–1.8	NE 1.8–2.0	ENE 1.6–2.0	SE 1.8–2.0	E 1.6–1.8	NNW 1.2–1.8	NE 1.8	NE 1.6–1.8
1940,	E. Nov.	NE 1.6–1.8	NE 1.8–2.0	ESE 1.6	SE 1.8	SSE 1.8	N 1.7	ENE 1.8	…
1940,	L. Nov.	NE 1.6–1.8	NE 2.0	SE 1.6–2.0	SE 1.4–1.8	E 1.4–1.6	N 1.4	ENE 1.2–1.6	ENE 1.3–1.6
1940,	E. Dec.	NE 1.4	NE 1.3–1.6	SE 1.4–1.8	SE 1.8–2.0	ESE 1.8–2.1	ENE 1.0	NE 0.8–1.6	NE 0.8–1.8
1941,	M–L. Jan.	…	NE 1.2–1.8	NE 0.8–1.0	SSE 1.3–1.8	E 2.1–2.4	NE 1.5–1.7	E 2.6	…
1941,	Feb.	NE 1.4	ENE 1.3–1.6	SE 1.6	SE 1.4–1.8	E 1.4–1.6	N 1.8	ENE 1.4	ENE 1.3
1941,	E. March	NE 1.4	NE 1.4	E 1.5	SSE 1.6–1.8	E 1.4–1.8	E 1.4–1.6	E 1.2–1.6	NE 1.4
1941,	M–L. Mar.	NE 1.3–1.4	ENE 1.6–1.8	ESE 1.2–1.6	SSE 1.3–1.7	E 1.4–1.8	N 1.4–1.8	E 1.6–1.8	NE 1.6–1.8
1941,	E.–M. Apr.	NE 1.2–1.6	ENE 1.6–1.8	ENE 1.3–1.5	SSE 1.3–1.6	E 1.6–2.2	E 1.2–1.6	E 1.4	NE 1.4
1941,	M–L. Apr.	NE 1.4–1.8	NE 1.4–1.8	ESE 1.6	SE 1.8	ENE 1.4–1.6	NE 1.3	ENE 1.2–1.3	NE 1.2–1.4
1941,	May	NE 1.5	ENE 1.4	SE 1.8–2.0	SE 1.6–1.8	NE 1.4–1.6	NE 1.2	NE 1.2	NE 1.4
1941,	E. Jun.	ENE 2.2–2.8	ESE 1.4–1.6	ESE 1.4–1.8	E 1.4–1.6	NNE 1.4–2.0	ENE 1.5	NE 1.4–1.6	NE 1.4
1941,	L. Jun.	NE 1.8	NE 1.3	E 1.3	SSE 1.4–1.8	E 1.5–1.8	ENE 1.6–1.8	SE 1.6–1.8	ENE 1.4
1941,	E.–M. Jul.	E 1.8	ENE 1.6	ENE 1.3–1.6	ESE 1.8–2.4	ESE 1.8–2.0	ESE 1.3–1.6	ESE 1.3	NE 1.4
1941,	M–L. Jul.	NE 2.1	ENE 1.4–1.8	NE 1.4–1.8	ESE 1.4–2.0	E 1.8	E 1.3–1.6	E 1.0–1.6	NE 1.6–2.0
1941,	E.–M. Aug.	ENE 1.1–1.4	E 1.8	E 1.8–2.0	SE 1.6–1.8	E 1.8–2.1	E 1.5–1.6	SE 1.6	E 1.5–1.6
1941,	Sept.	NE 1.3–1.6	ENE 1.4–2.0	E 1.1–1.8	SSE 1.8–2.3	ESE 1.4–1.6	NW 1.0–1.4	ESE 1.6–2.2	NE 1.4–1.8
1941,	Oct.	NE 1.5–1.6	NE 1.6	E 1.5–1.8	SE 1.7	E 1.6	NW 1.3–1.7	E 1.4–1.6	NW 1.8–2.0
1941,	Nov.	NE 2.0	NE 1.8–2.0	E 1.6	SE 1.6	E 1.6	N 1.5	ENE 1.8–2.2	ENE 1.8–2.2
1941,	Dec.	NNE 1.7–2.1	NE 1.8–1.9	ESE 1.4–1.6	SE 1.8–2.0	E 1.8–2.1	NNW 1.6	E 1.6–1.8	NE 1.4
1942,	Jan.	NE 1.8–2.0	ENE 1.6	SE 2.0	SE 1.6–1.8	E 2.1–2.5	NW 1.5–1.8	ESE 1.6	NE 1.4–1.6
1942,	Feb.	E 1.8	NE 1.4–2.0	NE 1.4–1.8	SE 1.4–2.0	E 1.8–2.5	NNW 1.1–1.4	SE 1.5	E 1.4–1.5
1942,	Mar.	NE 1.4–1.6	NE 1.4–2.2	ESE 1.8–2.0	SE 1.6–2.2	E 1.7–2.1	NE 1.2–1.5	ENE 1.2–1.8	ENE 1.6
1942,	Apr.	NE 1.4–2.1	E 1.1–1.7	ENE 1.1–2.0	SSE 1.4–2.0	E 1.7–2.0	E 1.8	NE 1.6	NE 1.4–1.8
1942,	May	NE 1.4–1.8	ENE 2.0	E 1.6–2.0	ESE 1.6–2.0	ENE 1.5–1.7	E 1.2–1.8	NE 1.4–1.6	NE 1.4–1.6
1942,	Jun.	…	…	…	ESE 1.2–1.4	E 1.4–1.7	E 1.5–1.8	…	…
1942,	Jul.	NE 1.2–1.8	NE 1.6–2.3	E 1.3–1.8	…	…	N 1.4	E 1.2–1.7	NE 1.4–1.8
1942,	E.~M. Aug.	NE 1.4–1.8	ENE 1.8–2.1	ENE 1.6–1.8	SE 1.7–2.1	E 1.3–2.1	E 1.6–1.8	E 1.6–1.8	ESE 1.6–1.8
1942,	M.~L. Aug.	NE 1.8–2.1	ENE 2.0–2.3	E 2.0–2.3	SE 1.6	SE 1.4–1.6	E 1.5	SE 1.6	NE 1.4–1.8
1942,	E.~M. Oct.	NE 1.3–1.4	ENE 2.0–2.3	E 2.3–2.5	SE 2.0–2.3	SE 2.0	E 2.0	E 1.5	NE 1.6–1.8
1942,	M.~L. Oct.	NNE 1.8	NE 2.0–2.3	E 1.3	SE 2.0–2.2	E 1.8–2.2	ENE 1.8–2.0	ESE 1.5	NE 1.8
1942,	E.~M. Nov.	N 1.7	ENE 2.0–2.3	E 1.9–2.1	SE 1.9–2.5	ESE 2.1–2.4	E 1.8–2.1	E 1.4–2.0	NE 1.8–2.2
1942,	M.~L. Nov.	N 1.4	E 1.6	E 1.5	E 2.0	2.0–2.4	2.0–2.3	2.2–2.6	…
1942,	Dec.	N 1.4	NE 2.0–2.5	E 2.1–2.8	ESE 2.3–2.7	SE 2.8	NE 1.5	NE 2.2	NE 1.8–2.2
1943,	Jan.	NE 2.1	E 2.3	NE 1.8–2.0	E 1.2–1.4	SE 1.4–1.6	…	…	…
1943,	E.~M. Feb.	NE 2.1–2.8	NE 2.3	NE 1.8	E 2.0	…	…	…	…
1943,	M.~L. Feb.	…	…	E 2.7	SE 2.7	…	…	…	…
1947,	Jun.	…	…	E 2.5	E 1.7	ESE 1.4	SE 2.3–2.7	ENE 1.7–2.6	…
1948,	Oct. Nov.	…	2.0	1.2	1.2	2.0	2.0	2.0	…
1949,	Sept. Oct.	2.0	1.8	1.8	1.3	1.3	2.0	1.3	…
1950,	Mar.	…	3.0	3.0	…	…	3.0	1.8	1.7
1950,	Jun. Jul.	2.0	1.8	1.5	2.6	2.6	2.5	1.9	2.2

Table 1B The Breadth (sea-miles) of the Strongest Stream (Max. Vel. in Tab. 1A) of the Dynamically Computed Kuroshio and the Distance (sea-miles) of the Stream Axis from the Coast. St. a–h (see Fig. 1), the same location in Tab. 1A.

Year	Month	Breadth (sea-miles)								Distance (sea-miles)							
		St. a	St. b	St. c	St. d	St. e	St. f	St. g	St. h	St. a	St. b	St. c	St. d	St. e	St. f	St. g	St. h
1936,	M.–L. Oct.	..	..	..	70	70	40	..	..	..	..	..	55	..	45	..	20
1936,	Dec.–	55	30	40	50	40	50	30	30	110	90	80	135	220	60	40	40
1937,	E. Feb.	..	..	50	..	..	30	..	..	..	..	100	..	..	15	..	..
1937,	Jul.–Aug.	..	..	40	50	40	40	45	..	..	..	30	60	190	60	40	..
1938,	Feb.	45	30	40	40	30	20	..	..	30	60	80	160	230	55	..	..
1938,	E. June	20	75	55	50	55	40	..	..	50	35	55	110	220	200	..	..
1938,	Aug.	30	45	40	50	55	30	25	25	80	55	55	80	190	225	25	30
1938,	Oct.	40	40	45	50	55	45	30	30	50	55	80	100	190	100	25	15
1939,	Jan.	60	50	45	50	25	25	20	..	45	40	70	190	190	110	30	..
1939,	Mar.	50	50	50	40	35	30	20	30	50	60	90	140	260	35	25	35
1939,	Aug.	35	30	40	40	25	30	30	..	40	25	50	120	230	40	25	..
1939,	Oct.	25	35	25	35	30	50	30	25	50	45	40	60	190	70	30	30
1939,	Dec.	25	35	30	30	40	40	30	28	40	25	30	75	200	90	20	15
1940,	M.L. Jan.	25	25	30	35	50	50	25	25	30	25	40	65	200	210	30	25
1940,	E.M. Mar.	50	35	35	50	35	25	40	30	80	40	45	100	200	210	60	60
1940,	E. Apr.	40	40	75	50	45	40	40	30	90	55	80	120	190	120	35	30
1940,	L. Apr.	40	40	40	55	70	35	30	25	95	60	80	140	180	135	30	25
1940,	L. May	..	20	15	40	45	40	30	30	..	20	40	90	270	250	50	30
1940,	E.–M. Jun.	20	15	20	20	30	30	25	25	70	25	45	110	190	100	25	20
1940,	M–L. Jun.	..	30	30	20	25	50	..	25	..	20	40	110	170	60	..	30
1940,	July	..	40	30	35	30	40	30	30	..	40	50	60	160	60	30	30
1940,	E–M Aug.	40	35	50	35	40	40	30	30	25	20	45	90	210	100	25	25
1940,	L. Aug.	40	30	30	45	35	30	10	20	70	30	30	110	220	75	10	20
1940,	L. Sept.	30	20	30	30	40	40	25	..	75	30	50	130	220	105	30	..
1940,	E. Oct.	30	55	50	35	50	35	20	20	60	40	55	100	205	90	20	20
1940,	L. Oct.	30	35	40	25	30	30	20	20	70	45	30	90	190	70	20	20
1940,	E. Nov.	30	20	30	30	30	30	20	..	60	50	40	95	230	80	20	..
1940,	L. Nov.	20	20	20	55	40	30	15	25	40	35	90	150	210	95	30	30
1940,	E. Dec.	30	30	40	30	30	30	30	25	80	40	60	160	200	40	30	30
1941,	M.–L. Jan.	..	30	50	40	30	30	20	..	..	70	40	90	200	70	20	..
1941,	Feb.	30	30	40	40	30	25	20	25	40	30	90	160	250	40	40	40
1941,	E. Mar.	30	45	30	30	60	30	30	30	80	45	60	150	260	30	30	30
1941,	M.–L. Mar.	45	30	50	35	35	30	30	30	60	60	60	135	255	120	25	40
1941,	E.–M. Apr.	25	30	30	40	40	15	20	20	50	65	70	105	260	15	30	30
1941,	M.–L. Apr.	40	40	25	30	40	40	40	30	65	50	90	190	240	80	25	25
1941,	May	25	40	30	30	35	30	25	25	60	50	100	185	230	40	25	25
1941,	E. Jun.	35	33	55	50	50	35	30	35	70	65	100	160	75	100	40	35
1941,	L. Jun.	20	50	35	35	35	30	40	40	60	75	60	140	260	30	30	35
1941,	E.–M. Jul.	30	30	30	50	50	35	20	40	80	75	80	140	210	40	25	45
1941,	M.–L. Jul.	30	35	40	45	25	30	45	25	95	90	110	100	210	30	35	45
1941,	E–M. Aug.	40	30	45	60	35	30	20	20	90	80	105	120	210	30	20	30
1941,	Sept.	30	30	40	30	35	60	30	30	80	20	40	105	205	70	15	35
1941,	Oct.	25	35	30	30	50	50	30	55	45	35	45	100	210	105	25	40
1941,	Nov.	10	40	50	30	30	40	20	25	60	30	50	110	210	60	20	30
1941,	Dec.	30	40	30	40	35	30	25	25	55	70	13	130	240	125	15	30
1942,	Jan.	30	30	30	30	30	40	30	25	70	20	65	140	250	90	20	30
1942,	Feb.	30	30	30	45	30	30	20	30	80	60	40	60	280	85	20	30
1942,	Mar.	50	50	30	35	30	35	30	30	55	70	80	140	280	50	20	25
1942,	Apr.	35	35	40	40	35	35	40	40	60	50	110	100	280	35	40	35
1942,	May	50	25	35	40	40	40	25	25	80	90	115	130	30	40	60	30
1942,	Jun.	..	..	..	25	20	20	..	..	..	..	..	30	20	25	..	..
1942,	Jul.	40	35	35	45	..	35	30	35	55	60	40	60	..	70	20	20
1942,	E.–M. Aug.	35	40	40	40	40	40	30	35	80	30	35	65	220	20	20	25
1942,	M.–L. Aug.	35	30	30	30	40	30	30	30	40	30	50	100	180	30	20	25
1942,	E.–M. Oct.	35	30	30	30	30	30	20	30	80	30	30	80	160	210	20	30
1942,	M.–L. Oct.	15	30	45	35	30	30	30	30	50	20	60	90	180	190	20	30
1942,	E.–M. Nov.	20	25	40	40	40	30	25	30	40	15	30	80	160	200	20	30
1942,	M.–L. Nov.	35	40	30	40	45	45	10	..	75	20	45	70	140	190	10	..
1942,	Dec.	10	35	30	30	35	40	20	20	60	35	30	65	160	190	30	30
1943,	Jan.	40	30	35	30	30	..	..	..	60	40	70	30	115	..	..	..
1943,	E.–M. Feb.	20	40	20	20	..	..	..	..	35	30	20	70	..	..	..	..
1943,	M.–L. Feb.	..	..	20	25	..	..	..	..	..	..	15	50	..	..	..	..
1947,	Jun.	..	..	20	35	40	35	40	..	..	..	..	40	80	130	140	..
1948,	Oct. Nov.	..	..	40	45	40	50	25	..	..	35	30	20	60	60	80	..
1949,	Sept. Oct.	30	30	30	30	40	25	40	..	50	40	50	40	50	25	50	..
1950,	Mar.	..	20	30	..	..	25	..	..	..	15	15	..	..	80	..	..
1956,	Jul.	35	30	50	20	25	20	30	..	50	60	20	20	60	80	80	55