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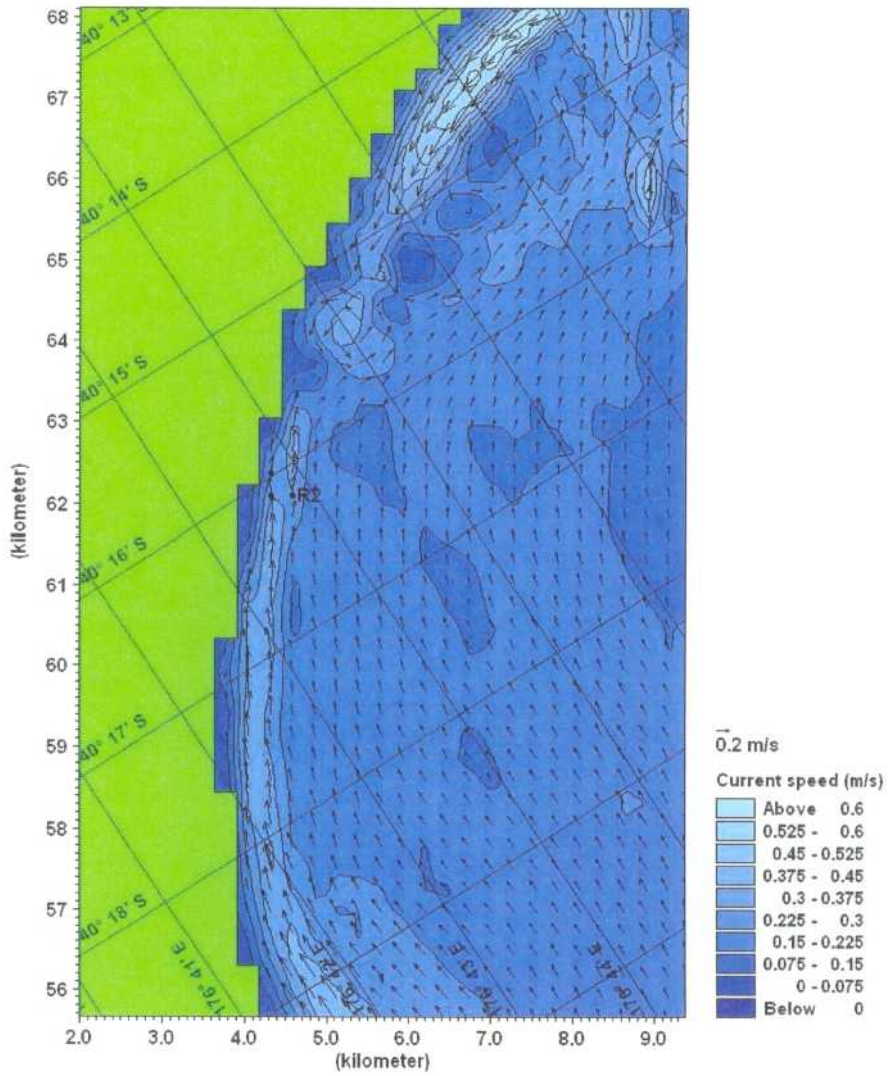

Figure 13d: Predicted residual currents in the vicinity of Porangahau River mouth under conditions of a strong Wairarapa Coastal Current, southerly storm wave conditions and tides.

0.5 day simulation for kelp species

Under tidal forcing (Figure A2.la) and weak WCC and easterly storm wave conditions (Figure A2.1b) very little transport of kelp occurs within 0.5 days. Under tides alone there is close to zero net transport in the area around the mouth of the Porangahau. To the north and south there are net currents towards the river mouth. Further offshore there is a net movement into deeper water. However, kelp are not transported into this zone before settling. Under the influence of average WCC and

wave conditions (Figure A2.1 c) there is limited transport to the north (2160 m up coast).

Under the influence of a strong WCC and southerly storm wave conditions (Figure A2.1 d) a net northerly residual current is set up near the release point (Figure 10c) which results in the transport of kelp as far as Blackhead Point (up to 6210 m upcoast and 2430 m offshore).

4-day and 10-day simulations for bubu, limpet, and paua species

Under tidal forcing (Figure A2.2a) very little transport of bubu, limpet, and paua occurs within 4 days due to the low residual current in the area around the mouth of the Porangahau. To the north and south there are net currents towards the river mouth. Further offshore there is a net movement into deeper water. However, larvae are not transported into this zone before settling. Under the influence of a weak WCC and easterly storm wave conditions (Figure A2.2b) net currents at the release site result in limited transport to south (3240 m down coast). Under the influence of average WCC and wave conditions (Figure A2.2c) the net current is to the north resulting in larvae settling up to 2700 m up coast. Under these conditions there is limited transport offshore (max. 1080 m).

Under the influence of a strong WCC and southerly storm wave conditions (Figure A2.2d) a net northerly residual current is set up near the release point (Figure 10c) which results in the transport of kelp as far as Blackhead Point (6480 m up coast and 2430 m offshore).

Very little difference in the extent of dispersal occurs between the 4 and 10-days. Under tides alone (Figure A2.3a) and weak WCC and easterly storm wave conditions (Figure A2.3b) slightly more larvae settle near the source - suggesting that the rate at which larvae settle near the source is higher than the rate that occurs remotely. Under average and strong WCC and wave conditions (Figures A2.3c-d) slightly more larvae are predicted to settle remotely.

20 and 30-day simulations for kina

The patterns of dispersal for 20 and 30-day simulations for kina (Figures A2.4a-d) show very similar patterns to those observe for bubu, limpet and paua after 10-days. This suggests that an equilibrium pattern of larval dispersion for all these species at this release point is being reached after around 10-days. Consequently, very little difference in the extent of dispersal occurs between the 20 and 30-day simulations for

kina. With an additional 10-days of dispersal slightly higher number of larvae settle near the source (as a percentage of the total larvae settled) suggesting that the rate of settling near the source is higher than the rate that occurs remotely.

2.7.3 Release point 3 (Blackhead Point)

Figures 14 a-d show the predicted residual currents for the four conditions modelled in the vicinity of this release point. Under tides only residual flows are to the south and are relatively uniform north of Blackhead Point but flow to the west south of Blackhead Point. Under tides, weak WCC and easterly storm wave conditions the residual currents are again to the south with more shore directed residuals both to the north and south of Blackhead Point. Under tides, average WCC and wave conditions the residual currents run inshore at Blackhead Point and diverge flowing up the coast north of Blackhead Point and down the coast to the south. A similar pattern is observed under tides, strong WCC and southerly storm wave conditions.

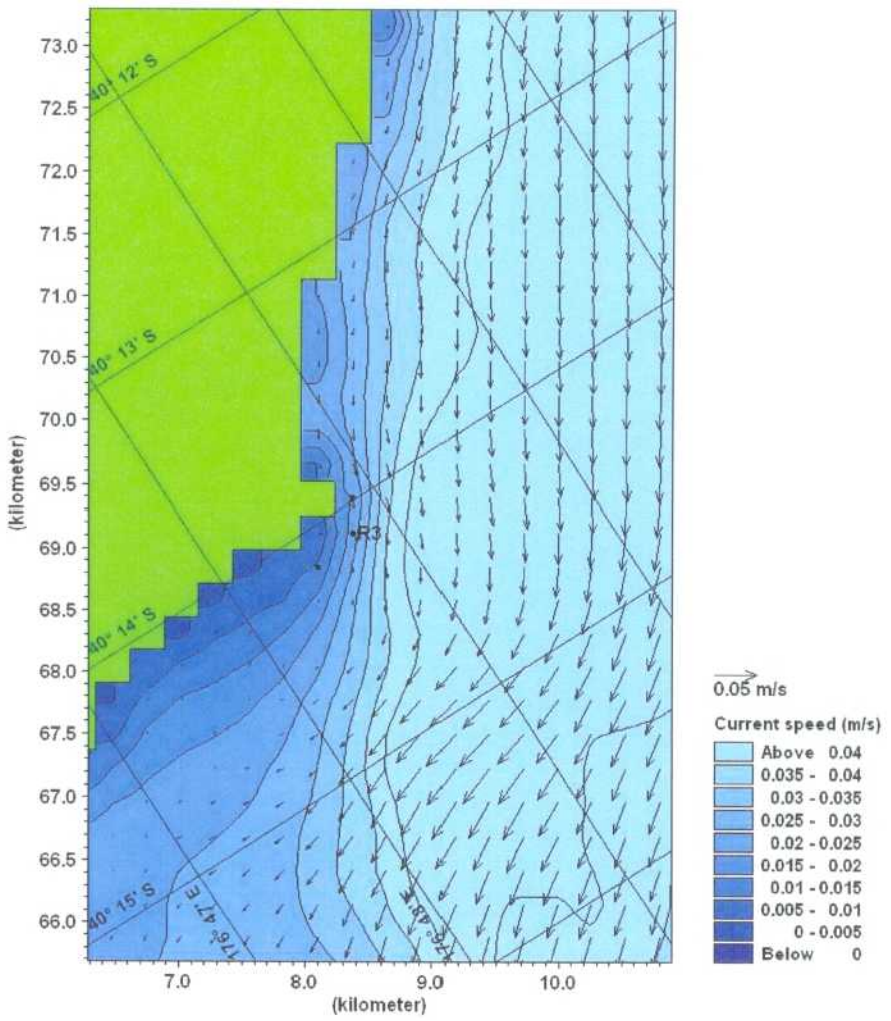

Figure 14a: Predicted residual tidal currents in the vicinity of Blackhead Point.

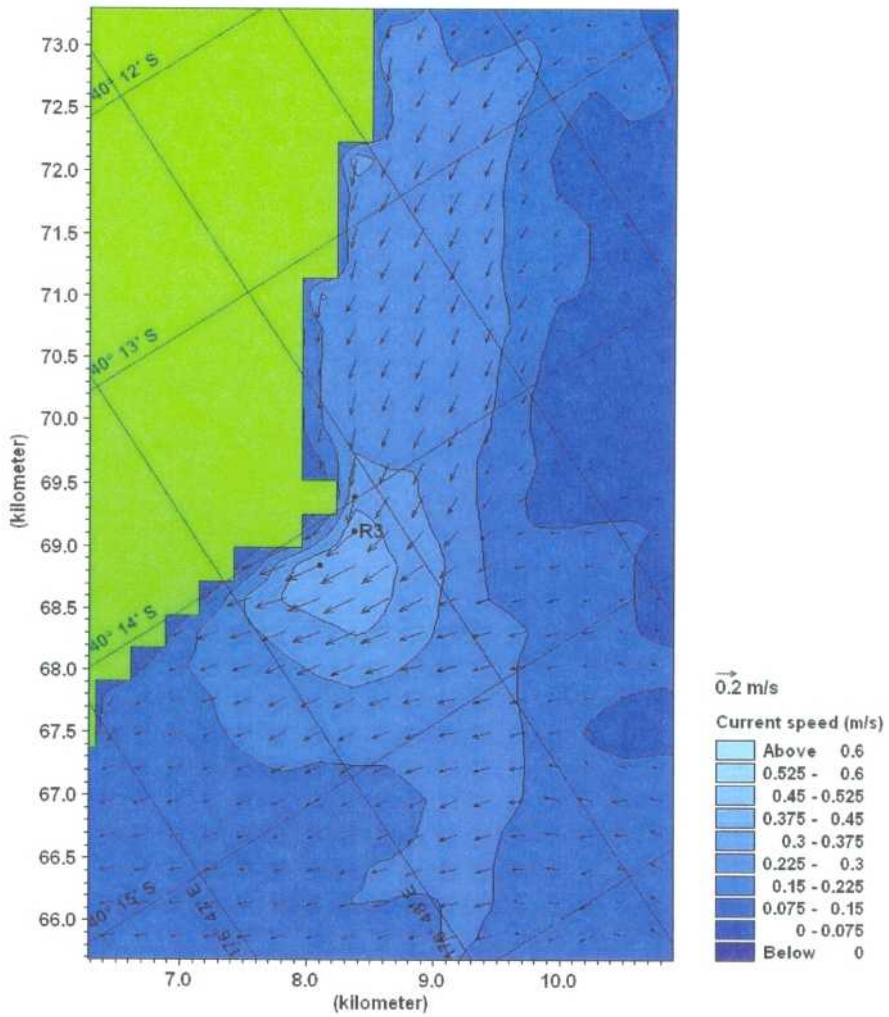

Figure 14b: Predicted residual currents in the vicinity of Blackhead Point under conditions of a weak Wairarapa Coastal Current, easterly storm wave conditions and tides.

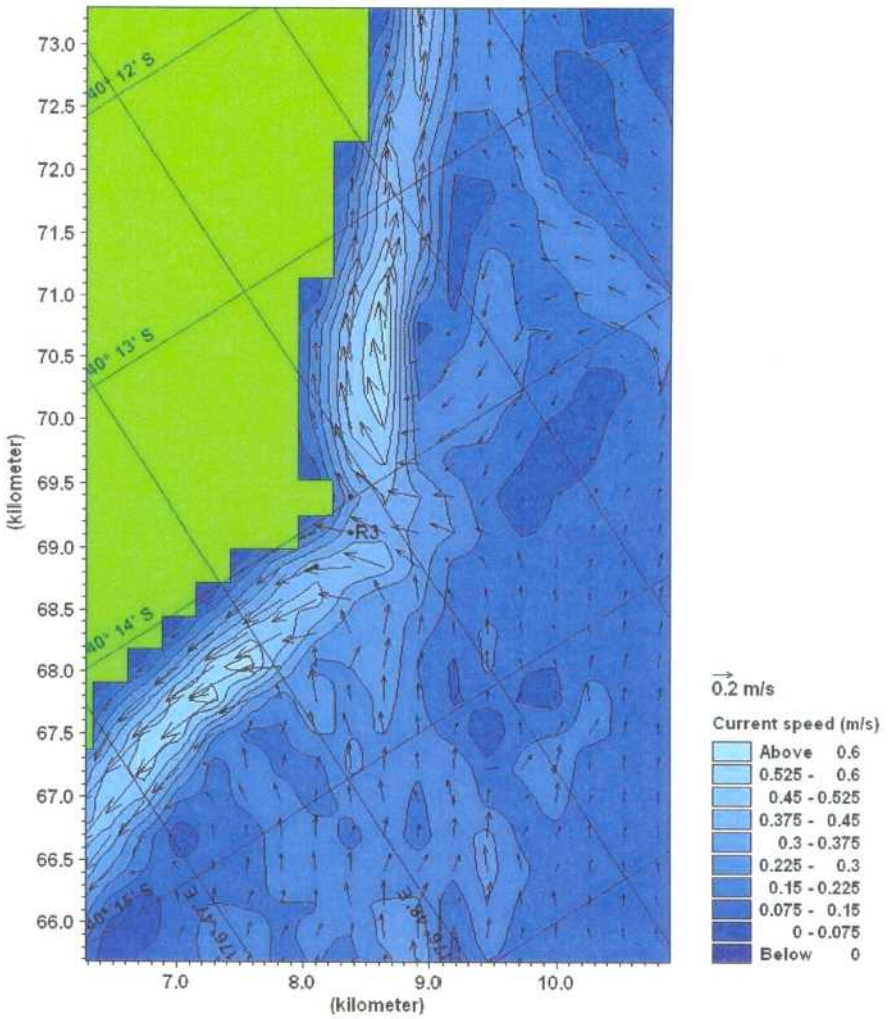

Figure 14c: Predicted residual currents in the vicinity of Blackhead Point under conditions of an average Wairarapa Coastal Current, average wave conditions and tides.

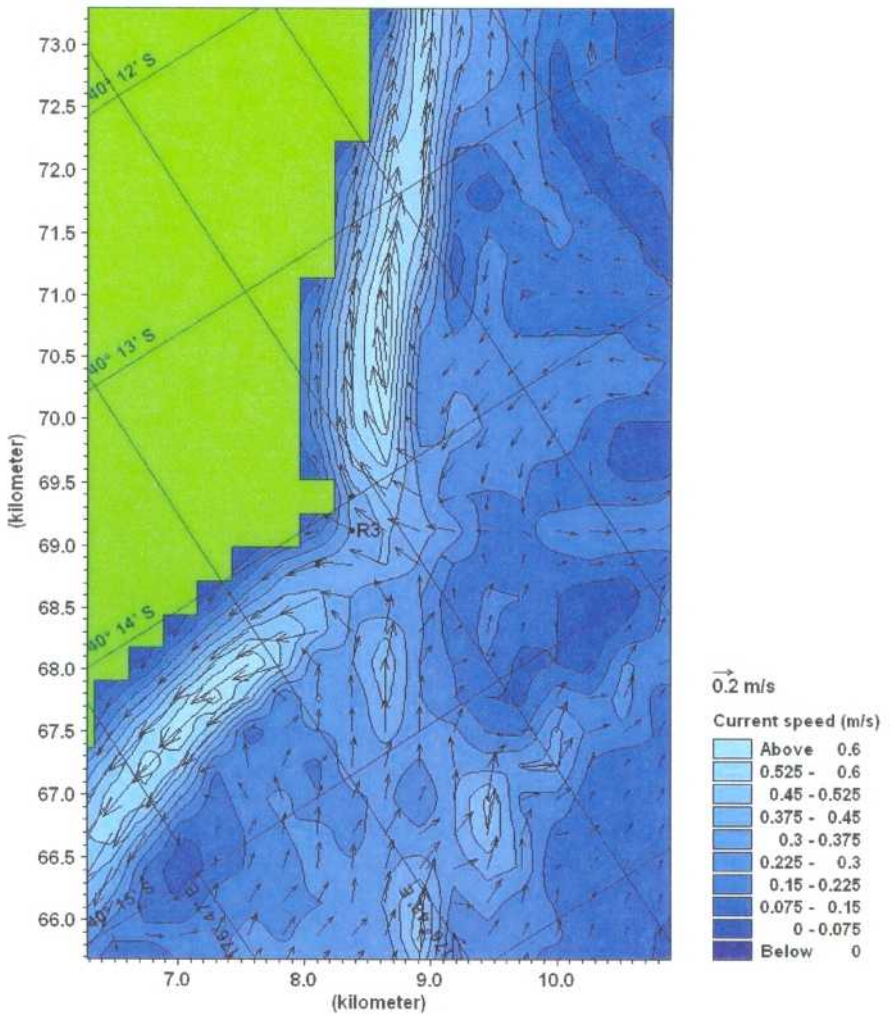

Figure 14d: Predicted residual currents in the vicinity of Blackhead Point under conditions of a strong Wairarapa Coastal Current, southerly storm wave conditions and tides.

0.5 day simulation for kelp species

Under tidal forcing (Figure A3.la) very little transport of kelp occurs within 0.5 days. A relatively strong residual current exist just offshore of the headland (Figure 8) but the relatively shallow depths in the immediate vicinity of the release point mean that a large proportion of the kelp settle before being transported into this area. Under the influence of WCC and waves (Figures A3.1b-d) there is progressively more dispersal both up and down coast as the strength of the WCC increases (weak - 540m, average - 2700m and strong - 4320 m).

4-day and 10-day simulations for bubu, limpet, and paua species

Under tidal forcing (Figure A3.2a) very little transport of these species occurs within 4 days. Movement is predominantly directly south into the deeper waters off Blackhead Point (1890 m down coast and 1890 m offshore). Under the influence of a weak WCC and easterly storm wave conditions (Figure A3.2b) net currents at the release site result in transport along the coast to the south beyond the Porangahau River mouth (8640 m down coast). Under the influence of average WCC and wave conditions (Figure A3.2c) dispersal occurs both up and down coast (16740 m and 5130 m respectively) with high larvae numbers either side of Blackhead Point. Beyond the Marine Reserve larvae numbers are low (less than 0.1 percent per cell). For both these conditions there is limited transport of larvae offshore. Under the influence of a strong WCC and southerly storm wave conditions (Figure A3.2d) larvae are dispersed either side of Blackhead Point (5130m down coast and 21600 m up coast) and offshore (up to 2430 m). Settled larvae numbers at the Marine Reserve are around 0.2% (of the total settled population) per cell.

For tides alone there is very little difference in the predicted pattern of dispersal after 10-days (Figure A3.3a) compared to the 4-day simulation (Figure A3.2a). This suggest that the equilibrium dispersal/settling pattern for these species is reached within 4 days.

After 10-days of settling under weak WCC and easterly storm wave conditions (Figure A3.3b) a slightly higher proportion (-0.3 percent per cell) of larvae settle just south of the release point (mid way between Blackhead Point and the mouth of the Porangahau River) compared to the 4-day simulation.

For average WCC and wave conditions (Figure A3.3c) an additional 6-days of dispersal leads to higher numbers of larvae settling towards the Porangahau River Mouth. The overall pattern of dispersal predicted at the end of 10-days is very similar to the 4-day simulation.

For strong WCC and southerly storm wave conditions (Figure A3.3d) an additional 6-days of dispersal leads to higher numbers of larvae settling towards the Porangahau River Mouth and in the deeper water directly south of Blackhead Point, with also dispersal occurring to the north (29700 m up coast).

20 and 30-day simulations for kina

Under tidal forcing (Figure A3.4a) settling of kina is mostly in the vicinity of the release point. Settling occurs up to 4320 m down coast with net currents driving larvae

offshore as they are dispersed away from Blackhead Point. To the north residual currents are limited (Figure 8) and hence very little settling of kina occurs to the north of Blackhead Point. Under the influence of a weak WCC and easterly storm wave conditions (Figure A3.4b) net currents at the release site result in dispersal and settling to south (8910 m down coast) past the Porangahau River mouth. Under the influence of average WCC and wave conditions (Figure A3.4c) larvae are dispersed and settle on either side of Blackhead Point and the net current to the north (Figure 10b) results in larvae settling up to 16740 m up the coast. Under these conditions there is limited transport offshore (max. 1350 m).

Under the influence of a strong WCC and southerly storm wave conditions (Figure A3.4d) larvae are dispersed either side of Blackhead Point (5130m down coast and 29700 m up coast) and offshore (up to 2430 m). Settled larvae numbers at the Marine Reserve are around 0.2% (of the total settled population) per cell.

Very little difference in the extent and pattern of dispersal occurs between the 20 and 30-days. For tides alone (Figure A3.5a), and weak WCC and easterly storm wave conditions (Figure A3.5b), slightly more larvae have settled south of Blackhead Point. For average WCC and wave conditions (Figure A3.5c) and strong WCC and southerly storm wave conditions (Figure A3.5d) only slightly more larvae settle near the mouth of the Porangahau River. This indicates that the equilibrium dispersal pattern for kina has been reached within 20 days.

2.7.4 Release point 4 (Te Angiangi Marine Reserve)

Figures 15 a-d show the predicted residual currents for the four conditions modelled in the vicinity of this release point. Under tides only, residual flows are to the south and are relatively uniform along this stretch of coast. Under tides, weak WCC and easterly storm wave conditions a small residual current to the north is setup along the coastline to the immediately north and south of the Marine Reserve. Further offshore of the Marine Reserve residual currents are predicted to be to the south. Under tides, average WCC and wave conditions the residual currents are predicted to be to the north. A similar pattern of residuals are observed under tides, strong WCC and southerly storm wave conditions but the magnitude of the residuals is higher.

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