HOMEWORK 2
COMP3121 - ALGORITHM DESIGN

QUESTION 3

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SOLUTION

The required algorithm can be achieved through the application of the Convolution principle. Convolution essentially achieves the multiplication of two polynomials by finding the values of coefficients at a given degree of x. The entire process will take nlogn time, where n is the size of the larger array.

We can find the solution to this solution by applying that methodology. However, to apply the context of the convolution algorithm to the current example, the second array in convolution is reversed when calculating the coefficients. To counteract this, we can use a new array N^l such that,

$$N^l[i] = N[n-1-i], \ 0 \leq i \leq n-1$$

With the Net, whenever we encounter a hole, this will not catch any fish. Similarly, since we will be multiplying $N^l[i]$ with corresponding metre on the beach, if $N^l[i] = 0$ then it will only add 0 and the number of fish caught will remain unchanged at that spot.

Once the convolution array is populated with the corresponding number of fish caught from each position along the beach, we traverse the array to find the max value of fishes that can be caught from a position.

The convolution is applied once and takes O(nlogn) and finding the max position will be O(n). So for our example, the total time would be O(n*logn).