

Water Quality Improvement after Establishing Seawater Exchange System at Jumunjin Harbor in Korea

Sang-Ho Oh¹ · Dal Soo Lee¹ · Kwang Soo Lee¹ · Dong Jun Han² · Chang Il kim³

¹ Korea Ocean Research & Development Institute (KORDI)

² Gangwon Provincial University · ³ Yooshin Engineering Corporation

Introduction

✧ Environmental problems in Jumunjin harbor

- Jumunjin : Located on the east coast of Korean peninsula
- Narrow harbor mouth & Closed waters
- Had suffered serious pollution problems in the past



Seawater exchange system

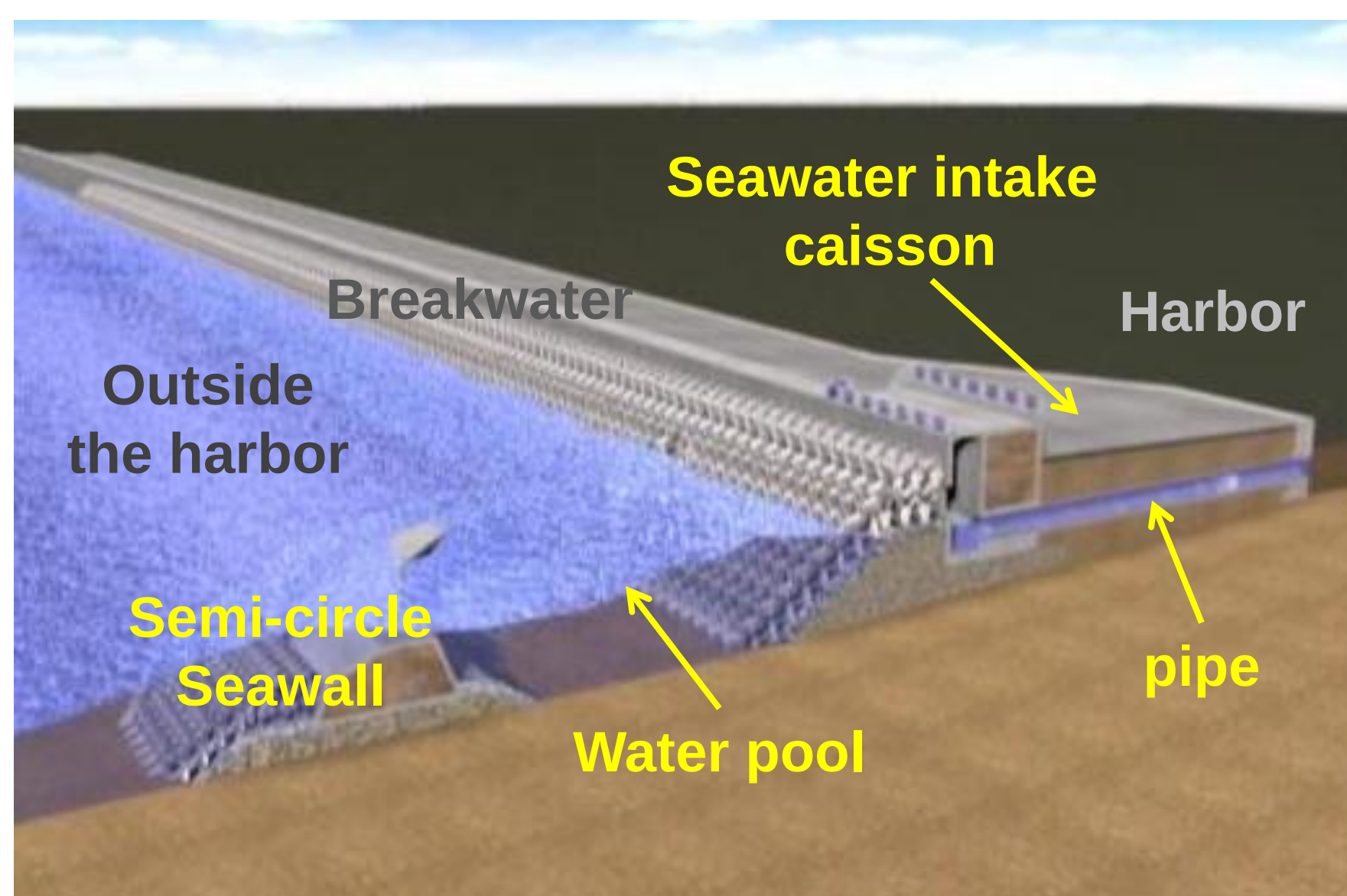
✧ Improvement of water quality

- Water quality of Jumunjin harbor has been greatly improved after establishing seawater exchange system
- The results of water quality monitoring before, during, and after the construction of seawater exchange system are reported in this study

Seawater Exchange System

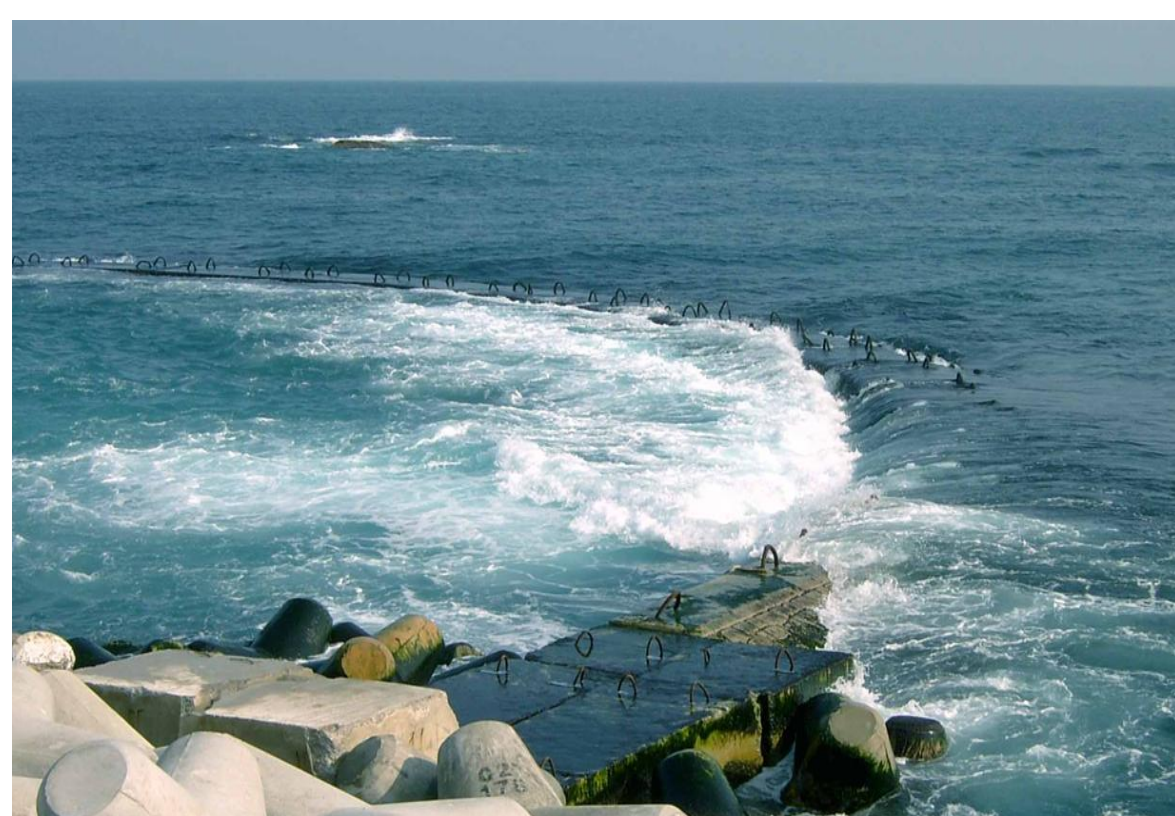
✧ General configuration

- Consists of three seawater intake caissons and a detached semi-circle seawall exterior to the preexisting breakwater



- Perimeter of the semi-circle seawall : 110 m
- Width of each caisson : 8 m (Total width : 8 m @ 3 = 24 m)
- Diameter of the pipe : 1.5 m (two pipes in each caisson)
- Mean seawater level at water pool is maintained slightly higher than that inside harbor : forms unidirectional flows to the harbor

✧ Construction of the seawater exchange system

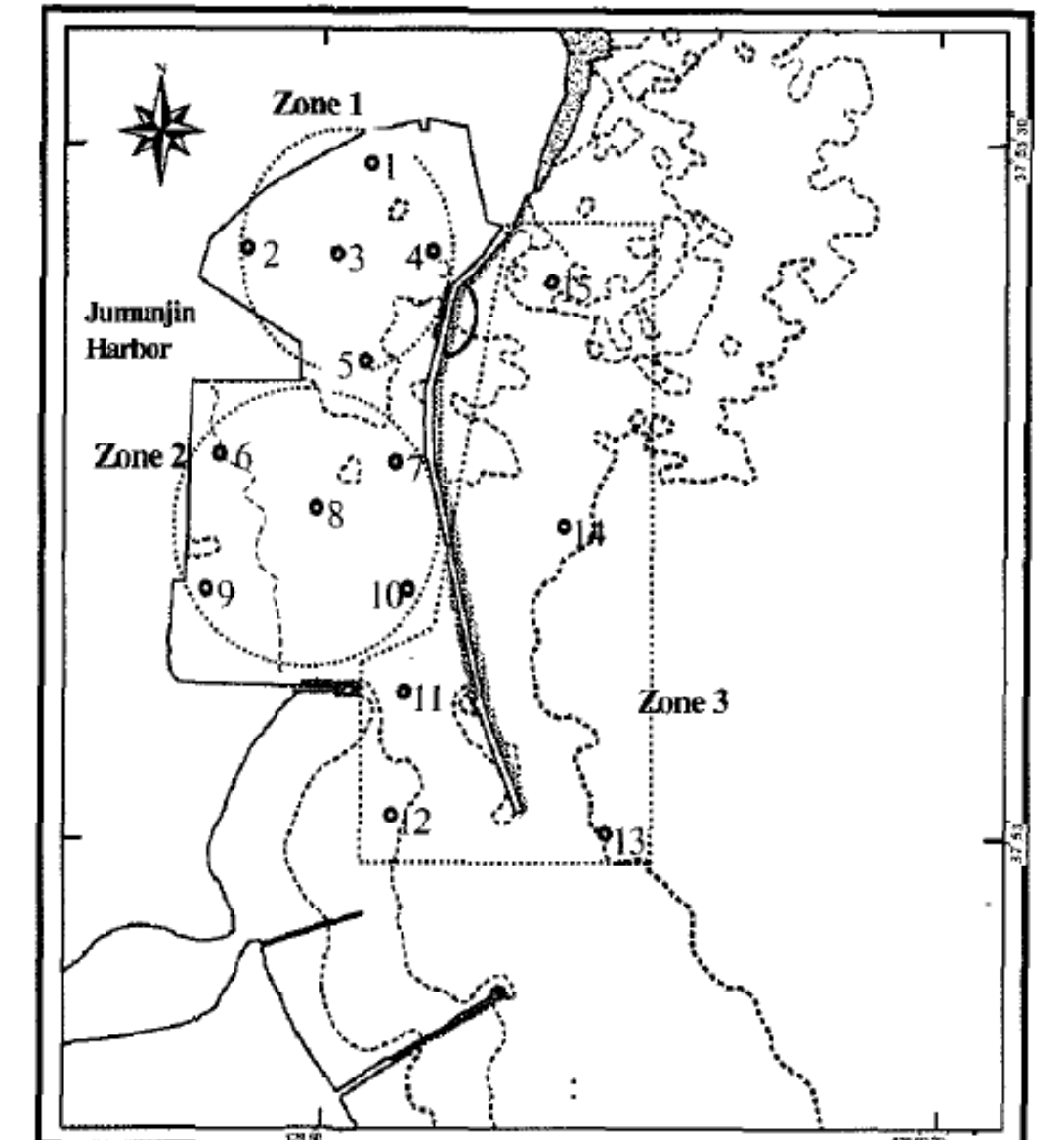


- Accomplishment : Apr. 2004
- Target intake volume : 1,000,000 m³/week
- Net circulation rate: 97% / 3 weeks

Water Quality Monitoring

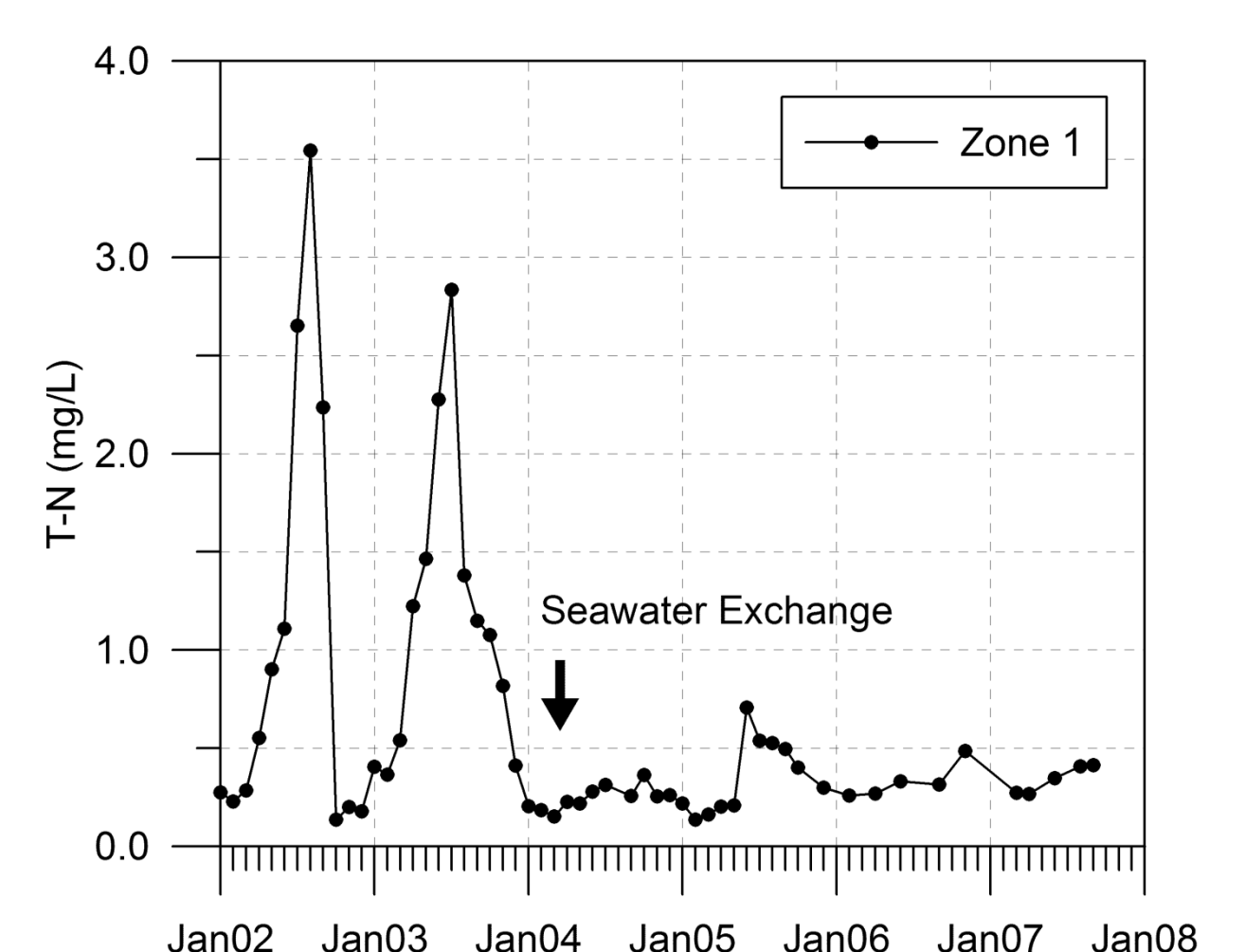
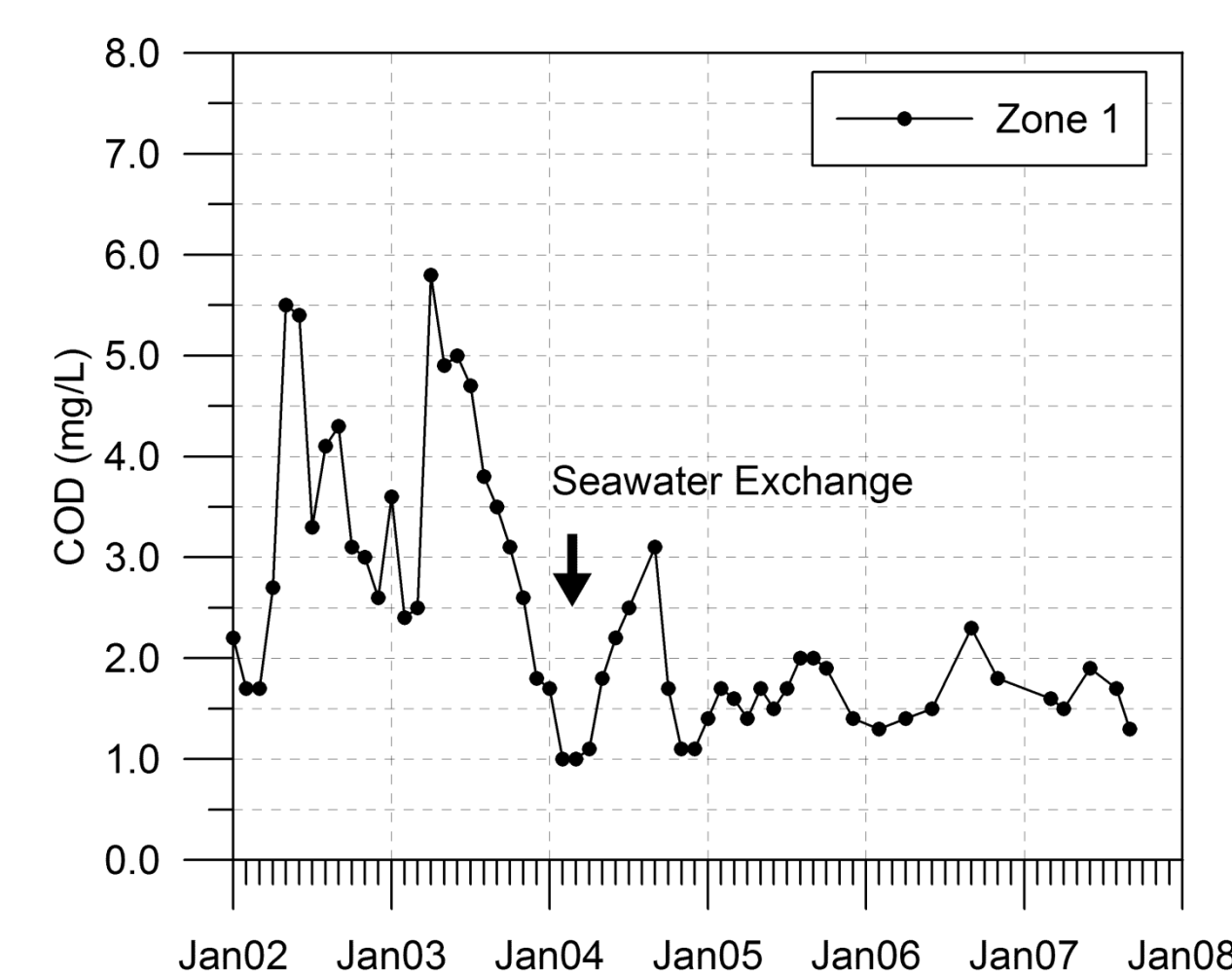
✧ Locations & Parameters

- 15 sampling stations around the harbor (See right figure)
- Categorized into three 'Zones'
- Monitoring period
 - ♦ Jan. 2002 ~ Sep. 2007
- Monitoring parameters
 - ♦ 11 index parameters as follows
 - ♦ Temperature, Salinity, ph, DO(Dissolved Oxygen), SS(Suspended Solids), COD(Chemical Oxygen Demand), T-N(Total Nitrogen), T-P(Total Phosphorus), Ammonia, Nitrate, Nitrite



✧ Results of monitoring

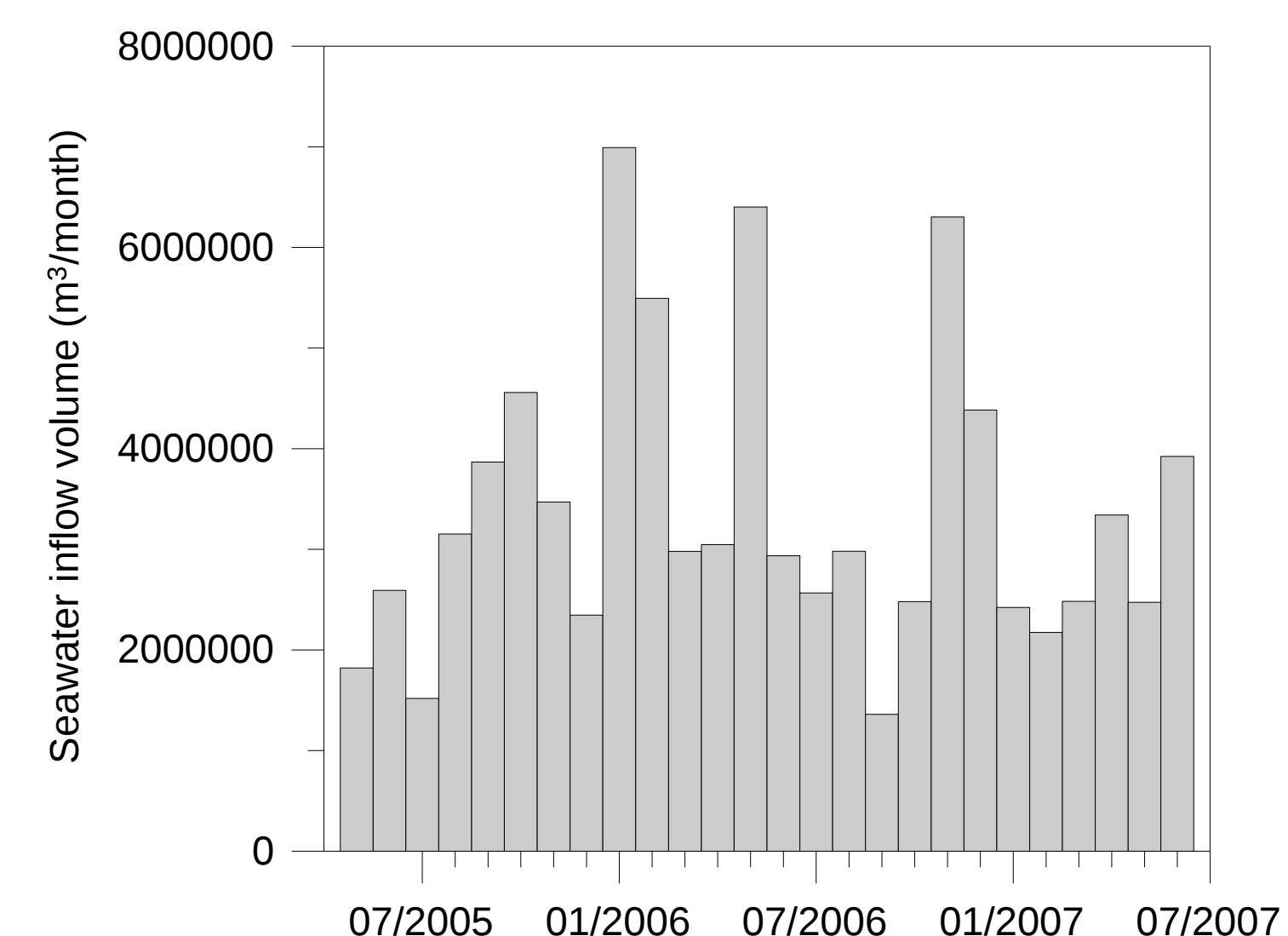
- Water quality was dramatically improved after completion of the seawater exchange system
- The improvement was most apparent in Zone 1 (See figures below), where water quality deterioration was the most serious in the past
- Seasonal variation of parameters were found, which is ascribed to smaller waves (except during typhoon passage) and increase of eutrophication under high temperature in summer season



Seawater Intake Volume

✧ Observation of intake volume

- Besides the water quality monitoring, seawater intake volume through the pipes was also measured since 2005
- On average, 3,729,800 m³/month of seawater is estimated to be taken into the harbor, correspondent to the target intake volume (1,000,000 m³/week) considered in the design of the structure



Contact

✧ Korea Ocean Research & Development Institute

- Sang-Ho Oh (ohsangho@kordi.re.kr)
- Dal Soo Lee (dslee@kordi.re.kr)
- Kwang Soo Lee (kslee@kordi.re.kr)