

## 12. Transport Services - Shipping

### 12.1 Services and Route Structures

Eighty-nine liner services call at the ports considered in the Ethiopia Logistics Masterplan Diagnostic, these being Djibouti, Port Sudan, Massawa, Assab (although there was no data available for Assab) Mogadishu, Mombasa, Kismayo and Berbera. To qualify, a service needs to call at a port at least once. If only services that call at least once a month are considered, the total number of services reduces to 67 (refer to **Table 12.1** for a list of services and ports/regions of call).

None of the services is purely intra-regional, i.e. looping between only a selection of the nominated ports. Of the 67 services, six are regional in that they loop between one or more of the nominated ports and ports in the Gulf, Red Sea and Middle East. The majority of the services are, therefore, extra-regional in that they link one or more nominated port, possibly with a regional port(s), and with port(s) outside the immediate region.

The structure of the services is shown in finer detail in **Table 12.2**. The left-hand column presents the seven ports of interest (excluding Assab), and the row headings show the ports or regions connected. The number in the row-column intersect is the number of services. The total row sometimes shows a number in excess of the total number of services, because the same service may be calling at more than one port of interest and is therefore double counted in the sum.

From these tables it can be seen that:

- Mombasa and Djibouti have the most extensive service connectivity networks, followed by Berbera and Port Sudan.
- Mombasa, Djibouti and Berbera are relatively well connected amongst the ports of interest.
- These three ports also have strong connectivity to the surrounding region. Thereafter, services extend mostly to the Indian Sub-Continent and further East, followed by East Africa and Europe.

**Table 12.1: Services Ports/Regions of Call (for services that call at least once per month)**

service code	service name	Berbera	Djibouti	Kismayu	Mogadishu	Mombasa	Massawa	Port Sudan	Red Sea	Gulf	MIDEA	FEAST	SE-AS	EUR	INDIA	AFR-E	NAM-E	AFR-S	AFR-N	SAM-W	NAM-W	AFR-W	AUSTR	IOISL	SAM-E	Intra	Reg	Extra	
ASEA2	ASEA KENYA					1				1		1	1		1														1
ASEA	ASEA TANZANIA				1	1			1	1		1	1	1	1	1								1					1
EAX1	ASIA EAST AFRICA EXPRESS SERVICE 1					1						1	1																1
EAX3	ASIA EAST AFRICA EXPRESS SERVICE 3					1				1		1	1		1														1
EAX1	Asia East Africa Service (EAX1)					1				1		1	1																1
EAX3	Asia East Africa Service (EAX3)					1						1	1		1														1
AKX-E	Asia Kenya Express (AKX) Eastbound					1						1	1		1														1
AKX-W	Asia Kenya Express (AKX) Westbound					1				1		1	1		1														1
AEM2	Asia Mediterranean Service (AEM2)																												
VEC	CAR CARRIER LINE		1				1		1	1		1	1	1	1					1									1
VEC	CAR CARRIER LINE (VEC)																												
CEA	CHINA EAST AFRICA EXPRESS					1						1	1		1	1							1						1
CEAX	CHINA EAST AFRICA EXPRESS					1						1	1		1	1							1						1
DESF	DAR ES SALAAM FEEDER																												
EA1	East Africa 1 - Mombasa (EA1)					1				1		1	1	1	1														1
EAX	EAST AFRICA EXPRESS	1			1	1				1		1			1	1		1											1
EAS	EAST AFRICA SERVICE (EAS)					1			1	1		1	1		1	1							1						1
EARS	EAST AFRICA TO RED SEA	1		1		1				1		1	1		1														1
AEF	Evergreen Asia-East Africa Service(AEF)					1				1		1	1		1								1						1
RES2	EVERGREEN FAR EAST-RED SEA SERVICE 2(RES2)		1						1	1		1	1		1	1													1
FTE	FEEDERTECH (FTE)	1	1			1		1	1	1		1	1	1	1	1		1		1									1
FAL1	FRENCH ASIA LINE 1 FAL 1																												
FAL	FRENCH ASIA LINE 1 (FAL 1)																												
GIA-N	Gulf India Africa Express (GIA) Northbound																												
GIA-S	Gulf India Africa Express (GIA) Southbound					1				1		1	1	1	1	1								1					1
IA	INTRA ASIA																												
IR5	INTRA-REDSEA FEEDER 5 (IR5)							1	1			1	1	1	1														1
JEDDEX	JEDDAH EXPRESS SERVICE					1			1	1		1	1	1		1													1
KENYA	KENYA EXPRESS					1						1	1										1						1
KYX	KENYA EXPRESS					1						1	1										1						1
KYX	Kenya Express (KYX)					1						1	1					1					1						1
KISIWA (25Z)	KISIWA EXPRESS					1						1	1		1	1								1					1
MASHARIKI (28J)	MASHARIKI EXPRESS					1			1			1	1			1													1
MASHARIKI	MASHARIKI EXPRESS SERVICE EASTBOUND																												
MASHARIKI	MASHARIKI EXPRESS SERVICE WESTBOUND					1			1			1	1		1	1													1
MASIKA (28D)	MASIKA EXPRESS		1			1			1	1					1	1		1						1					1
MASIKA	MASIKA EXPRESS EASTBOUND					1				1					1	1													1

service code	service name	Berbera	Djibouti	Kismayu	Mogadishu	Mombasa	Massawa	Port-Sudan	Red Sea	Gulf	MIDEA	FEAST	SE-AS	EUR	INDIA	AFR-E	NAM-E	AFR-S	AFR-N	SAM-W	NAM-W	AFR-W	AUSTR	IOISL	SAM-E	Intra	Reg	Extra
MASIKA	MASIKA EXPRESS WESTBOUND		1			1				1					1	1												1
MAWINGU	MAWINGU EXPRESS EASTBOUND																											
MAWINGU	MAWINGU EXPRESS WESTBOUND					1				1					1													1
MAWINGU (28X)	MAWINGU SERVICE					1			1	1			1		1													1
MECL1	MECL1 SERVICE EASTBOUND		1							1					1		1		1									1
MEX	Mediterranean Club Express																											
MOGADISHU	MOGADISHU EXPRESS			1	1	1			1	1		1	1	1	1	1							1					1
MXS	MOGADISHU EXPRESS SOUTHBOUND																											
MFX	MOMBASA FAR EAST (MFX)	1				1				1		1	1	1	1									1				1
MUSTANG	MUSTANG																											
NW2	New West Latin America Service 2																											
NOURA	NOURA EXPRESS	1			1	1			1	1		1	1		1	1		1						1				1
NWCIPAK	NWC TO IPAK		1						1	1		1	1	1	1	1		1	1			1	1					1
PETRA	PETRA SERVICE		1						1	1	1	1	1	1	1	1		1	1									1
REX2	Red Sea Express 2	1	1						1	1		1	1	1	1													1
REX2	RED SEA EXPRESS 2 (RS2)		1						1	1		1	1		1													1
RS2	RED SEA LOOP2		1						1	1		1	1															1
RES2	RED SEA SERVICE (RES2)		1			1		1	1	1		1	1		1			1										1
RSS	RED SEA SERVICE (RSS)		1						1	1		1	1	1	1		1											1
RS2	Red Sea Service 2 (RS2)																											
RSGIS	RED SEA/GULF/IPAK Service		1			1		1	1	1	1			1	1	1			1									1
RSSEAS	RED SEA/SOUTH-EAST AFRICA SERVICE		1			1		1	1		1			1	1	1		1	1									1
RGS	REDSEA GULF SERVICE (RGS)	1	1						1	1		1	1		1													1
EA3	SERVICE EA3					1				1		1	1															1
EAF	SERVICE EAF	1				1			1	1		1	1		1	1												1
SWAX2	SWAHILI EXPRESS					1				1		1	1		1	1												1
TANGA (24Z)	TANGA FEEDER					1						1		1		1												1
VE1	VEHICLE CARRIER SERVICE 1																											
VE1	Vehicle Carrier Service 1 (VE1)																											
BLUENILE (28A)	BLUE NILE EXPRESS		1			1			1	1				1	1													1
BNX	BLUE NILE EXPRESS EASTBOUND		1						1	1																		1
BNX	BLUE NILE EXPRESS WESTBOUND		1						1	1		1	1		1													1
BMSXN	BMS EXPRESS SERVICE NORTHBOUND	1							1	1																		1
BMSXS	BMS EXPRESS SERVICE SOUTHBOUND	1							1	1																		1
EURAF5	EUROPE AFRIQUE 5																											
GULFSAK2	FAS GULF EMIRATES IRAQ SHUTTLE 2																											
GULFJS1	FAS GULF JEDDAH FEEDER 1	1	1						1	1				1	1													1
INDKHIQ	FAS INDIAN SUB CONT. KHALIFA AND IRAQ SRV																											
GULFJYS	FAS JEBEL ALI YEMEN SERVICE	1	1						1	1					1													1

service code	service name	Berbera	Djibouti	Kismayu	Mogadishu	Mombasa	Massawa	Port Sudan	Red Sea	Gulf	MIDEA	FEAST	SE-AS	EUR	INDIA	AFR-E	NAM-E	AFR-S	AFR-N	SAM-W	NAM-W	AFR-W	AUSTR	IOISL	SAM-E	Intra	Reg	Extra	
REDSEAFD	FAS RED SEA FEEDER	1						1	1	1				1	1														1
REDSEAYF	FAS YEMEN FEEDER																												
MECL (600)	MECL		1			1			1	1		1	1		1		1		1										1
ME2 (405)	MIDDLE EAST 2 SERVICE (ME2)																												
MXN	MOGADISHU EXPRESS NORTHBOUND																												
MONA	MONA EXPRESS	1	1				1	1	1	1																		1	
MUSAFIR (27Z)	MUSAFIR EXPRESS				1					1																		1	
NUBIAN (28B)	NUBIAN EXPRESS		1					1	1	1		1		1	1				1										1
GULFJYS	SSLEUR JEBEL ALI YEMEN SERVICE	1							1	1																	1		
SUDAN (28F)	SUDAN FEEDER							1	1	1								1											1
UMX	UMX SERVICE (APL)		1							1		1			1		1		1										1
FEEDER (Y43)	Y43 JAL SLV BBO JED FEEDER	1							1	1		1	1																1
YX1	YEMEN EXPRESS 1	1	1						1	1		1	1		1			1	1										1
	Total	17	26	2	5	41	2	9	39	53	3	45	45	20	48	23	4	11	9	2	1	2	8	5	-	-	6	61	

Note: Services with no numbers had fewer than one call per month

**Table 12.2: Number of Services Connecting to Ports of Interest**

	Ports of Interest							Surrounding Region			Distant Zones											Total			
	Berbera	Djibouti	Kismayu	Mogadishu	Mombasa	Massawa	Port Sudan	Red Sea	Gulf	MIDEA	INDIA	FEAST	SE-AS	AFR-E	EUR	AFR-S	AFR-N	AUSTR	IOISL	SAM-W	NAM-E		NAM-W	AFR-W	SAM-E
Berbera		7	1	2	6	1	3	14	17	-	12	9	9	4	5	4	1	1	1	1	-	-	-	-	98
Djibouti	7		-	-	8	2	6	23	25	3	22	16	15	7	11	7	9	-	1	2	4	1	1	-	170
Kismayu	1	-		1	2	-	-	1	2	-	2	1	2	1	-	-	-	-	-	-	-	-	1	-	15
Mogadishu	2	-	1		4	-	-	3	5	-	4	4	3	4	2	2	-	-	2	-	-	-	1	-	37
Mombasa	6	8	2	4		-	4	16	28	2	32	31	32	21	11	7	3	8	5	1	1	-	1	-	223
Massawa	1	2	-	-	-		1	2	2	-	1	1	-	1	-	-	-	-	1	-	-	-	-	-	13
Port Sudan	3	6	-	-	4	1		9	7	2	7	3	3	3	6	4	3	-	-	1	-	-	-	-	62
Total	20	23	4	7	24	4	14	68	86	7	80	65	65	40	37	24	16	9	9	6	5	1	4	-	

Note: Dark grey shows 20 or more services and light grey 10 or more services

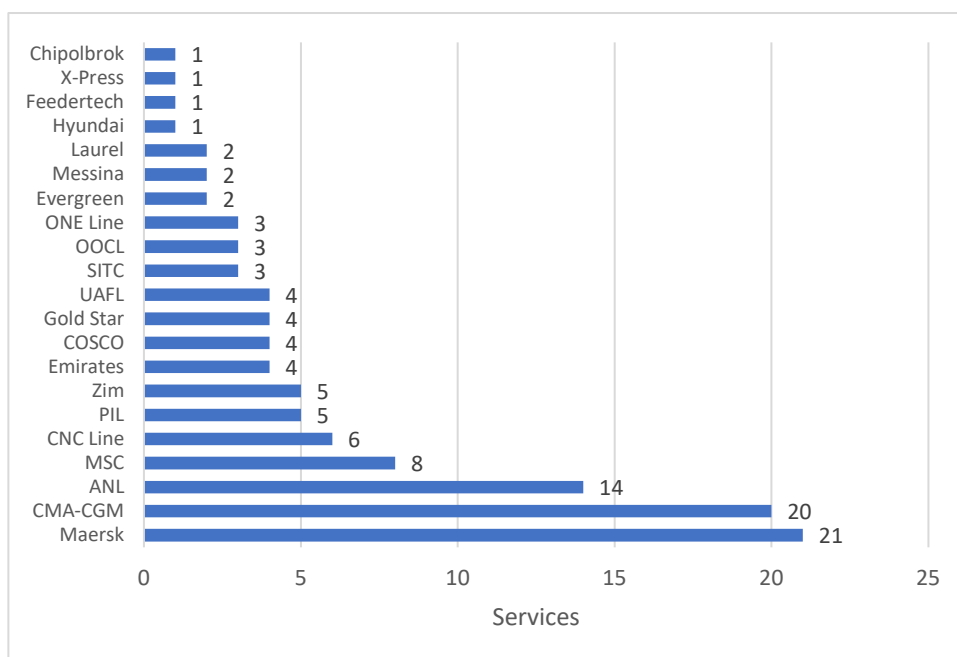
Regions: Gulf = Arabian Gulf; MIDEA = Middle East; FEAST = Far East; SE-AS = South-East Asia; EUR = Europe; INDIA = Indian Sub-Continent; AFR-E = East Africa; NAM-E = North America East Coast; AFR-S = Southern Africa; AFR-N = North Africa; SAM-W = South America West Coast; NAM-W = North-America West Coast; AFR-W = West Africa; AUSTR = Australasia; IOISL = Indian Ocean Islands; SAM-E = South-America East Coast

## 12.2 Liners

There are 21 liners participating in services to the ports of interest. These may be “operating” liners that actually provide the service or “sharing” in that they purchase capacity on another liner’s vessel. The relationship between liners may take the form of cooperating alliances, of which the major ones are 2M (Maersk and MSC), Ocean Alliance (CMA CGM, Cosco, Evergreen, OOCL), and Alliance 2022 (Hapag-Lloyd, ONE, Yang Ming, HMM).

**Table 12.3** presents the services linked to the participating liners, and **Figure 12.1** the summary per liner. The two dominant liners are Maersk and CMA-CGM, followed by ANL and MSC. Interestingly, the liner alliances are not active in their formal structures, with no shared 2M or Ocean Alliance services, but with CMA-CGM often joining up with ANL and CNC.

**Figure 12.1: Number of Services Participated in per Liner**



**Table 12. 3: Services per Liner**

Service Code	Service Name	CMA-CGM	MSC	Maersk	COSCO	PIL	ANL	OOCL	CNC Line	Evergreen	Hyundai	Feedertech	Emirates	ONE Line	Messina	Zim	Gold Star	Laurel	X-Press	UAFL	SITC	Chipolbrok
ASEA2	ASEA KENYA	1					1		1													
ASEA	ASEA TANZANIA	1					1		1												1	
EAX1	ASIA EAST AFRICA EXPRESS SERVICE 1							1														
EAX3	ASIA EAST AFRICA EXPRESS SERVICE 3							1														
EAX1	Asia East Africa Service (EAX1)				1																	
EAX3	Asia East Africa Service (EAX3)				1																	
AKX-E	Asia Kenya Express (AKX) Eastbound												1									
AKX-W	Asia Kenya Express (AKX) Westbound												1									
AEM2	Asia Mediterranean Service (AEM2)				1																	
VEC	CAR CARRIER LINE															1	1					
VEC	CAR CARRIER LINE (VEC)															1						
CEA	CHINA EAST AFRICA EXPRESS																1					
CEAX	CHINA EAST AFRICA EXPRESS																	1				
DESF	DAR ES SALAAM FEEDER		1																			
EA1	East Africa 1 - Mombasa (EA1)													1								
EAX	EAST AFRICA EXPRESS		1																			
EAS	EAST AFRICA SERVICE (EAS)					1																
EARS	EAST AFRICA TO RED SEA		1																			
AEF	Evergreen Asia-East Africa Service(AEF)									1												
RES2	EVERGREEN FAR EAST-RED SEA SERVICE 2(RES2)									1												
FTE	FEEDERTECH (FTE)											1										
FAL1	FRENCH ASIA LINE 1 FAL 1	1																				
FAL	FRENCH ASIA LINE 1 (FAL 1)	1					1		1													
GIA-N	Gulf India Africa Express (GIA) Northbound												1									
GIA-S	Gulf India Africa Express (GIA) Southbound												1									
IA	INTRA ASIA																					1
IR5	INTRA-REDSEA FEEDER 5 (IR5)					1																
JEDDEX	JEDDAH EXPRESS SERVICE	1					1															
KENYA	KENYA EXPRESS																	1				
KYX	KENYA EXPRESS																1					
KYX	Kenya Express (KYX)															1						
KISIWA (25Z)	KISIWA EXPRESS			1																		
MASHARIKI (28J)	MASHARIKI EXPRESS			1																		
MASHARIKI	MASHARIKI EXPRESS SERVICE EASTBOUND			1																		
MASHARIKI	MASHARIKI EXPRESS SERVICE WESTBOUND			1																		
MASIKA (28D)	MASIKA EXPRESS			1																		

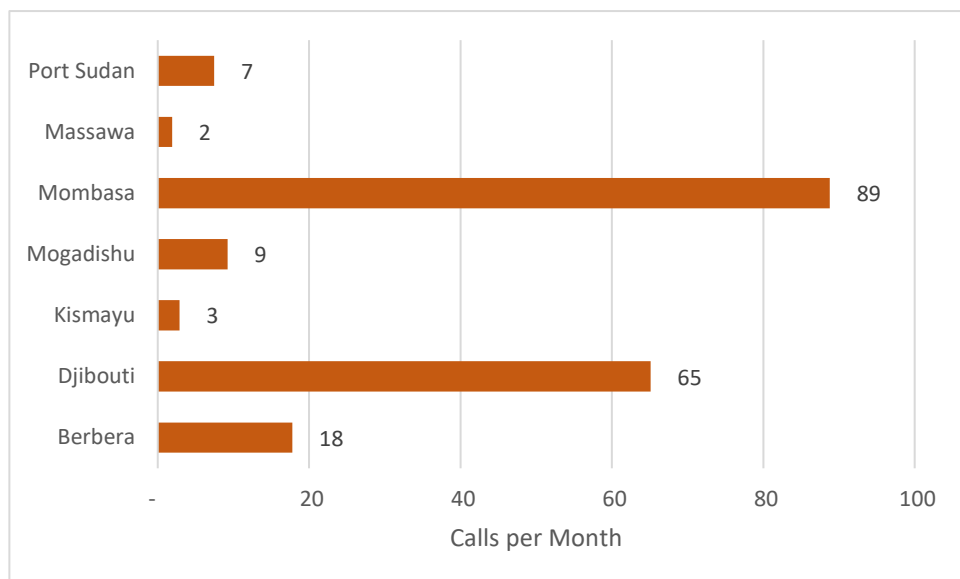
Service Code	Service Name	CMA-CGM	MSC	Maersk	COSCO	PIL	ANL	OOCL	CNC Line	Evergreen	Hyundai	FeederTech	Emirates	ONE Line	Messina	Zim	Gold Star	Laurel	X-Press	UAFL	SITC	Chipolbrok
MASIKA	MASIKA EXPRESS EASTBOUND			1																		
MASIKA	MASIKA EXPRESS WESTBOUND			1																		
MAWINGU	MAWINGU EXPRESS EASTBOUND			1																		
MAWINGU	MAWINGU EXPRESS WESTBOUND			1																		
MAWINGU (28X)	MAWINGU SERVICE			1																		
MECL1	MECL1 SERVICE EASTBOUND			1																		
MEX	Mediterranean Club Express	1					1		1													
MOGADISHU	MOGADISHU EXPRESS		1																			
MXS	MOGADISHU EXPRESS SOUTHBOUND																				1	
MFX	MOMBASA FAR EAST (MFX)																		1			
MUSTANG	MUSTANG		1																			
NW2	New West Latin America Service 2										1											
NOURA	NOURA EXPRESS	1					1															
NWCIPAK	NWC TO IPAK		1																			
PETRA	PETRA SERVICE		1																		1	
REX2	Red Sea Express 2	1																				
REX2	RED SEA EXPRESS 2 (RS2)	1					1		1													
RS2	RED SEA LOOP2							1														
RES2	RED SEA SERVICE (RES2)				1																	
RSS	RED SEA SERVICE (RSS)					1																
RS2	Red Sea Service 2 (RS2)					1																
RSGIS	RED SEA/GULF/IPAK Service														1							
RSSEAS	RED SEA/SOUTH-EAST AFRICA SERVICE														1							
RGS	REDSEA GULF SERVICE (RGS)					1																
EA3	SERVICE EA3													1								
EAF	SERVICE EAF													1								
SWAX2	SWAHILI EXPRESS	1					1		1													
TANGA (24Z)	TANGA FEEDER			1																		
VE1	VEHICLE CARRIER SERVICE 1															1	1					
VE1	Vehicle Carrier Service 1 (VE1)															1						
BLUENILE (28A)	BLUE NILE EXPRESS			1																		
BNX	BLUE NILE EXPRESS EASTBOUND			1																		
BNX	BLUE NILE EXPRESS WESTBOUND			1																		
BMSXN	BMS EXPRESS SERVICE NORTHBOUND																				1	
BMSXS	BMS EXPRESS SERVICE SOUTHBOUND																				1	
EURAF5	EUROPE AFRIQUE 5	1					1															
GULFSAK2	FAS GULF EMIRATES IRAQ SHUTTLE 2	1					1															
GULFJS1	FAS GULF JEDDAH FEEDER 1	1					1															

Service Code	Service Name	CMA-CGM	MSC	Maersk	COSCO	PIL	ANL	OOCL	CNC Line	Evergreen	Hyundai	Feedertech	Emirates	ONE Line	Messina	Zim	Gold Star	Laurel	X-Press	UAFL	SITC	Chipolbrok
INDKHIQ	FAS INDIAN SUB CONT. KHALIFA AND IRAQ SRV	1					1														1	
GULFJYS	FAS JEBEL ALI YEMEN SERVICE	1																				
REDSEAFD	FAS RED SEA FEEDER	1					1															
REDSEAYF	FAS YEMEN FEEDER	1					1															
MECL (600)	MECL			1																		
ME2 (405)	MIDDLE EAST 2 SERVICE (ME2)			1																		
MXN	MOGADISHU EXPRESS NORTHBOUND																			1		
MONA	MONA EXPRESS	1																				
MUSAFIR (27Z)	MUSAFIR EXPRESS			1																		
NUBIAN (28B)	NUBIAN EXPRESS			1																		
GULFJYS	SSLEUR JEBEL ALI YEMEN SERVICE	1																				
SUDAN (28F)	SUDAN FEEDER			1																		
UMX	UMX SERVICE (APL)	1																				
FEEDER (Y43)	Y43 JAL SLV BBO JED FEEDER			1																		
YX1	YEMEN EXPRESS 1		1																			
Total		20	8	21	4	5	14	3	6	2	1	1	4	3	2	5	4	2	1	4	3	1

## 12.3 Port Calls

The ports under consideration received some 193 vessel calls per month on average (see **Figure 12.2**). As is the case for the number of liner services, Mombasa (nearly half) and Djibouti (about a third of calls) dominate, with Berbera accounting for about a tenth of calls.

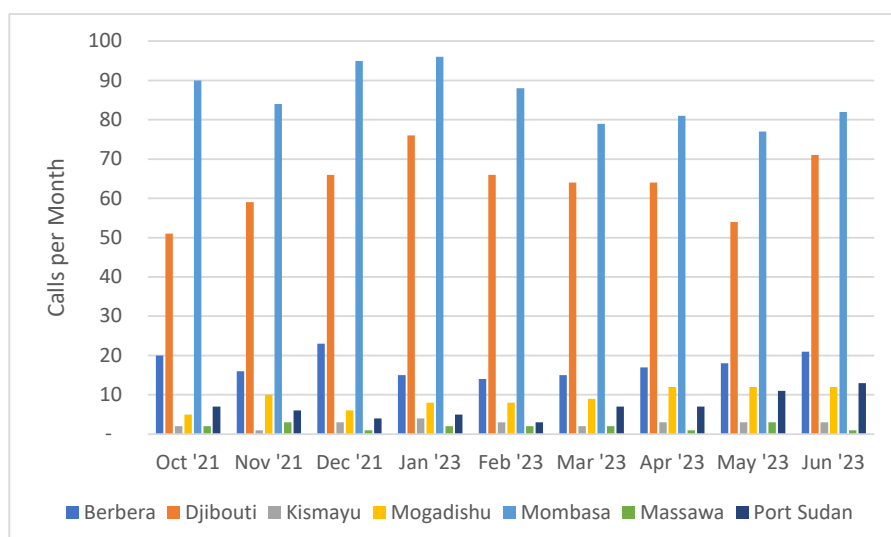
**Figure 12.2: Calls per Month per Port of Interest**



**Table 12.4** shows the detailed origin-destination (OD) matrix for the ports. The dominant frequencies are to/from Mombasa and South-East Asia, East Africa and the Indian Sub-Continent; and to/from Djibouti and the Red Sea and Gulf. Each of these five OD pairs represents about 10 per cent of the vessel call activity.

The period under consideration (October 2021 to June 2022) includes the tail-end of the Covid pandemic. However, as shown in **Figure 12.3**, there does not appear to have been a major correction in the number of vessel calls as the pandemic abated. Rather, the call numbers seem to demonstrate a seasonal pattern which is similar across all the ports. For the busiest ports, the variability (measured by standard deviation) is the smallest, i.e. the traffic the most stable.

**Figure 12.3: Monthly Call Numbers**



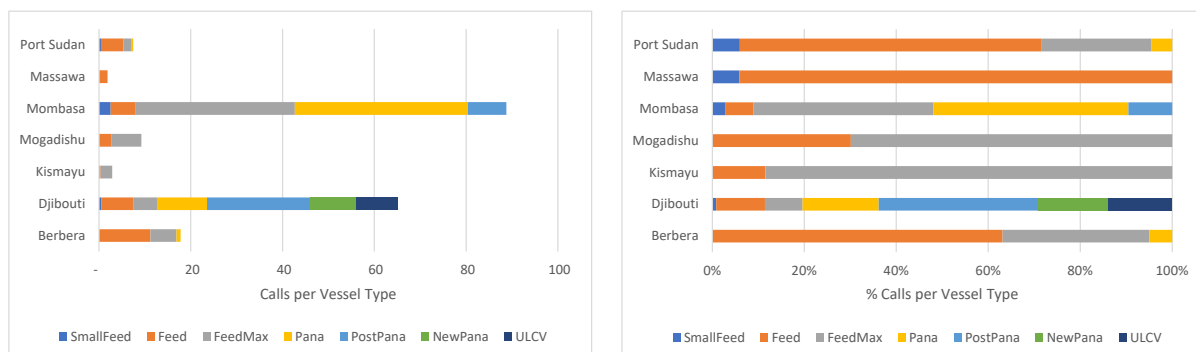
**Table 12.4: Average Monthly Calls from/to Port of Interest and Region**

	Berbera	Djibouti	Kismayu	Mogadishu	Mombasa	Massawa	Port Sudan	Red Sea	Gulf	MIDEA	INDIA	FEAST	SE-AS	AFR-E	EUR	AFR-S	AFR-N	AUSTR	IOISL	SAM-W	NAM-E	NAM-W	AFR-W	SAM-E	Total
Berbera	-	1	0	-	2	0	-	5	4	-	5	0	0	-	-	-	-	-	-	-	-	-	-	-	18
Djibouti	1	-	-	-	0	0	0	23	18	-	7	3	12	-	2	-	-	-	-	-	-	0	-	-	65
Kismayu	-	-	-	2	1	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Mogadishu	-	-	1	-	2	-	-	-	4	-	1	-	0	0	-	0	-	-	1	-	-	-	-	-	9
Mombasa	2	0	2	2	-	-	-	2	8	-	17	7	21	18	0	6	-	2	0	-	-	-	0	-	89
Massawa	1	0	-	-	-	-	-	0	0	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Port Sudan	0	0	-	-	-	-	-	6	1	-	0	-	0	-	0	-	-	-	-	-	-	-	-	-	7
Red Sea	5	8	-	-	3	1	6																		193
Gulf	8	27	-	3	15	-	0																		
MIDEA	-	-	-	-	-	-	-																		
INDIA	-	3	0	1	22	-	0																		
FEAST	0	2	-	-	2	0	0																		
SE-AS	0	16	-	0	24	-	0																		
AFR-E	-	-	-	-	10	-	-																		
EUR	-	2	-	-	0	0	-																		
AFR-S	0	-	-	-	6	-	-																		
AFR-N	-	-	-	-	-	-	-																		
AUSTR	-	-	-	-	3	-	-																		
IOISL	-	-	-	1	0	-	-																		
SAM-W	-	-	-	-	-	-	-																		
NAM-E	-	-	-	-	0	-	-																		
NAM-W	-	-	-	-	-	-	-																		
AFR-W	-	-	-	-	0	-	-																		
SAM-E	-	-	-	-	-	-	-																		
Total	18	60	3	9	89	2	7																		188

## 12.4 Vessel Sizes

**Figure 12.4** shows the breakdown of calls by vessel size, in absolute and relative (percentage) terms. As expected, the busier ports also attract vessels of a larger carrying capacity. The maximum vessel size at Mombasa is a Post Panamax, whilst at Djibouti, vessels reach a ULCV size (probably related to Djibouti's location on a major sea lane and the positioning of the Société de Gestion du Terminal à conteneurs de Doraleh (SGTD) as a transit hub. At the other ports, vessels are mostly of a Feeder (up to 3,000 TEU) and Feeder-max (up to 5,000 TEU) size. These are vessels that are often equipped with their own gear which enables them to self-handle cargo and not rely on port cranes.

**Figure 12.4: Vessel Size Distribution per Port of Interest**



*Note: Small Feeder < 1,000 TEU; Feeder < 2,000 TEU; Feeder-max < 3,000 TEU; Panamax < 5,000 TEU; Post-Panamax < 10,000 TEU; New Panamax < 15,000 TEU; ULCV (ultra-large container vessel) > 15,000 TEU*

**Figure 12.5** shows the average vessel size for each port of interest. Djibouti typically handles a Post-Panamax vessel and Mombasa a Panamax. The other ports all typically receive vessels at the upper end of the Feeder size.

**Figure 12.5: Average Vessel Size**

